Welcome!

This is the first in a series of teaching aids designed **by** teachers **for** teachers at level 5.
The worksheets are designed to support the delivery of the National Curriculum in a variety of teaching and learning styles. They are not designed to take the pedagogy away from the teacher.
The worksheets are centred around the shown level, but spiral from the level below to the level above. Consult the National Numeracy Strategy for definitive National Curriculum levels.
They can be used by parents with the support of the on-line help facility at www.10ticks.co.uk.

Contents and Teacher Notes.

Factors. An exercise using common factors to find dimensions of a cuboid. Finally finding Lowest Common Multiples.

Page 27. **Factors and Multiples Game.**
There is a similar game using only the numbers 1- 25, but it doesn't have a solution. This puzzle has been changed so pupil's don't feel cheated and can find a solution!

Pages 28/29. **Investigations using Indices**.
Investigations using indices.

Page 30. **Prime Pirate Maze.**
A very simple way of reinforcing the prime numbers and the "look" of a prime number. With less able groups write on the bottom of the sheet all the prime numbers from 1 to 100 as a reminder. The strategy for solving the maze is interesting to watch. Some pupils start from different points trying to find routes. Some simply colour in the prime numbers at random until the routes appear!

Page 31. **A Prime Maze.**
Work out the sum and then follow primes to the exit! Another way of trying to reinforcing prime numbers in an interesting fashion.

Page 32. **Prime and Square Numbers.**
A snakes and ladders game used to reinforce prime numbers and square numbers. It makes it a lot more interesting if pupils have to land exactly on the win square to finish.

Pages 33/34. **Multiplying by Powers of 10.**
Multiplying by powers of 10 in the format 10, 100, 1000,... as well as in index notation.

Pages 35/36. **Dividing by Powers of 10.**
Dividing by powers of 10 in the format 10, 100, 1000,... as well as in index notation.

Page 37. **Zap to Zero. Place Value.**
A game using the skills of place value.

Page 38. **Stamps.**
Four different investigations using stamps as a central theme.

Pages 39/40. **Probability (Equally Likely Outcomes)**.
Questions based around equally likely outcomes.

Pages 41/42. **Assigning Probabilities.**
The different ways of assigning probabilities are dealt with here. Pupils have to carry out surveys and experiments. There are SAT style questions choosing which method of assigning a probability is best. Finally, comparing Theory and Experimental probabilities.

Pages 43/44. **Experimental Probabilities.** (Bonus pages).
Pupils should be encouraged to find probabilities by experiment. Here we have questions based on experiments or surveys that have previously been carried out.

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Grid Multiplication 1.

This is how you work out 23 x 7 using grid multiplication.

	20	3
7	140	21

140 + 21 = **161**.

A). What sums are being worked out with these grids ?
You **do not** need to work out the answers !

1).

	60	8
4		

2).

	50	7
5		

3).

	20	4
9		

4).

	30	9
6		

5).

	70	1
8		

6).

	80	6
3		

7).

	40	2
7		

8).

	60	5
9		

B). Write down the sum being worked out in each grid.
Copy the grid and then work out the answer.

1).

	40	2
3		

2).

	20	1
6		

3).

	30	2
7		

4).

	50	4
4		

5).

	30	5
4		

6).

	60	5
3		

7).

	30	7
5		

8).

	40	3
6		

9).

	50	9
4		

10).

	70	6
3		

11).

	60	6
6		

12).

	70	2
8		

13).

	30	6
9		

14).

	40	8
8		

15).

	30	8
7		

16).

	50	8
6		

17).

	20	7
9		

18).

	90	5
7		

19).

	80	3
9		

20).

	80	9
7		

C). Draw the appropriate grid and then solve the following problems.

1). 4 x 28	2). 3 x 62	3). 5 x 73	4). 7 x 23	5). 6 x 35
6). 7 x 45	7). 4 x 67	8). 8 x 34	9). 3 x 95	10). 5 x 97
11). 9 x 23	12). 3 x 57	13). 4 x 93	14). 6 x 84	15). 7 x 68
16). 8 x 62	17). 7 x 97	18). 9 x 75	19). 6 x 97	20). 9 x 87

You can use grid multiplication to work out much harder sums, such as 36 x 72.

	30	6
70	2100	420
2	60	12

2100 + 420 + 60 + 12 = **2592**.

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D). What sums are being worked out with these grids ?
You **do not** need to work out the answers !

1).

	40	1
20		
5		

2).

	40	7
30		
9		

3).

	80	4
60		
3		

4).

	90	8
70		
6		

5).

	40	3
90		
8		

6).

	80	6
50		
3		

7).

	50	8
20		
8		

8).

	60	5
30		
6		

E). Write down the sum being worked out in each grid.
Copy the grid and then work out the answer.

1).

	30	6
20		
3		

2).

	10	7
40		
1		

3).

	40	3
20		
7		

4).

	30	4
50		
3		

5).

	20	6
30		
4		

6).

	10	8
20		
4		

7).

	30	3
40		
2		

8).

	20	4
60		
2		

9).

	70	4
40		
1		

10).

	40	5
30		
8		

11).

	20	9
50		
7		

12).

	70	8
40		
3		

13).

	80	3
20		
6		

14).

	60	8
40		
3		

15).

	70	2
30		
7		

16).

	90	4
50		
1		

17).

	60	2
70		
6		

18).

	50	1
80		
3		

19).

	30	9
70		
2		

20).

	90	5
20		
9		

F). Draw the appropriate grid and then solve the following problems.

1).	34 x 64	2).	57 x 63	3).	38 x 54	4).	93 x 18	5).	41 x 32
6).	53 x 36	7).	63 x 39	8).	72 x 48	9).	19 x 74	10).	38 x 92
11).	69 x 48	12).	74 x 38	13).	63 x 85	14).	78 x 69	15).	85 x 59
16).	97 x 84	17).	76 x 85	18).	49 x 98	19).	96 x 87	20).	79 x 86

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Grid Multiplication 2.

A). These multiplication grids have been partly filled in.
Copy each one and fill in the missing numbers.

1).

	30	**2**
		12

= 192

2).

	50	**3**
		12

= 212

3).

	70	
	140	12

= 152

4).

5	200	35

= 235

5).

		5
	180	15

= ___

6).

	20	
	140	28

= ___

7).

4	240	28

= ___

8).

	90	**6**
		18

= ___

9).

6	300	

= 324

10).

		9
		36

= 356

11).

		6
		42

= 392

12).

8	240	

= 280

13).

	60	**4**
	540	

= ___

14).

6	420	12

= ___

15).

		8
		32

= 392

16).

	80	
		45

= 445

17).

	60	21

= ___

18).

	100	35

= ___

19).

	150	45

= ___

20).

	180	27

= ___

21).

	280	21

= ___

22).

	200	16

= ___

23).

	150	12

= ___

24).

	200	8

= ___

25).

	240	18

= ___

26).

	400	24

= ___

27).

	420	36

= ___

28).

	540	36

= ___

29).

	450	

= 470

30).

	280	

= 336

31).

		40

= 760

32).

		36

= 516

33).

	720	

= 783

34).

		28

= 588

35).

		72

= 632

36).

	810	

= 846

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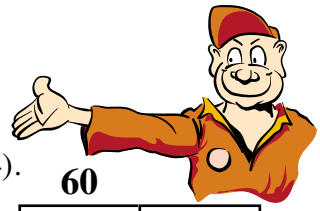
B). These are harder multiplication grids. They also have been partly filled in. Copy each one and fill in the missing numbers.



1).

30	600	
2		10

= 800

2).

	30	**7**
	1200	
		21

= ___

3).

		4
50	1000	
		4

= ___

4).

	60
	1800
4	12

= ___

5).

50	**2**
2000	
	14

= ___

6).

	3
	180
2	80

= ___

7).

20	
	450
140	

= ___

8).

60	
1200	
	56

= ___

9).

600	100
120	20

= 840

10).

1200	240
60	12

= 1512

11).

2400	420
80	14

= 2914

12).

1400	80
630	36

= 2146

13).

3000	360
100	12

= 3472

14).

2100	420
120	24

= 2664

15).

2000	300
80	12

= ___

16).

2400	420
40	7

= ___

17).

600	140
270	63

= ___

18).

900	210
120	28

= ___

19).

3500	50
560	8

= ___

20).

2000	450
280	63

= ___

21).

600	60
180	

= 858

22).

600	120
	18

= 828

23).

	120
630	36

= 2886

24).

4200	
180	15

= 4745

25).

5600	210
560	

= 6391

26).

5400	
450	5

= 5915

27).

4800	320
	28

= 5568

28).

	180
210	6

= 6696

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Long Multiplications.

Copy and answer the following questions.

Multiplications.

1). 24 x 4	2). 56 x 5	3). 72 x 8	4). 45 x 9	5). 95 x 3
6). 47 x 6	7). 78 x 4	8). 96 x 6	9). 73 x 5	10). 81 x 8
11). 36 x 9	12). 53 x 7	13). 28 x 8	14). 39 x 9	15). 97 x 6
16). 517 x 5	17). 409 x 6	18). 624 x 4	19). 536 x 3	20). 246 x 7
21). 583 x 4	22). 603 x 6	23). 704 x 5	24). 389 x 7	25). 639 x 8
26). 419 x 8	27). 874 x 7	28). 892 x 9	29). 486 x7	30). 793 x 9
31). 2552 x 3	32). 6406 x 5	33). 6437 x 4	34). 3379 x 6	35). 2394 x 7
36). 4605 x 7	37). 8930 x 6	38). 1438 x 7	39). 4582 x 5	40). 9403 x 6
41). 3742 x 8	42). 8462 x 7	43). 7932 x 9	44). 2573 x 6	45). 9607 x 9

Long Multiplications.

1). 32 x 21	2). 43 x 52	3). 49 x 25	4). 63 x 32	5). 53 x 45
6). 53 x 46	7). 64 x 28	8). 39 x 28	9). 48 x 39	10). 83 x 25
11). 59 x 56	12). 65 x 82	13). 25 x 79	14). 75 x 47	15). 93 x 43
16). 49 x 86	17). 67 x 92	18). 47 x 81	19). 84 x 93	20). 97 x 86
21). 34 x 78	22). 76 x 76	23). 29 x 75	24). 56 x 83	25). 67 x 85
26). 48 x 76	27). 72 x 91	28). 89 x 97	29). 48 x 86	30). 98 x 99

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Even Longer Multiplications !

1). 324 × 14	2). 251 × 23	3). 405 × 17	4). 721 × 32	5). 373 × 43
6). 527 × 36	7). 409 × 41	8). 724 × 26	9). 936 × 27	10). 646 × 35
11). 952 × 58	12). 846 × 82	13). 637 × 75	14). 379 × 48	15). 294 × 86
16). 684 × 96	17). 973 × 78	18). 749 × 93	19). 869 × 78	20). 958 × 68
21). 903 × 53	22). 486 × 65	23). 672 × 38	24). 948 × 99	25). 683 × 65
26). 759 × 56	27). 605 × 87	28). 925 × 89	29). 975 × 67	30). 793 × 73

31). 804 x 67 32). 487 x 62 33). 839 x 84 34). 942 x 58 35). 507 x 82
36). 983 x 38 37). 843 x 79 38). 399 x 78 39). 287 x 56 40). 989 x 76

Harder Questions

41). 6532 × 24	42). 1425 × 37	43). 7826 × 63	44). 7964 × 86	45). 9361 × 74
46). 5473 × 431	47). 2544 × 253	48). 6036 × 147	49). 8697 × 657	50). 4621 × 365
51). 2483 × 632	52). 7583 × 672	53). 9376 × 976	54). 8793 × 796	55). 2964 × 573

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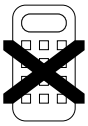
Division.



Copy and solve the following questions.

1). $4\overline{)92}$ 2). $6\overline{)84}$ 3). $3\overline{)93}$ 4). $5\overline{)80}$

5). $8\overline{)96}$ 6). $4\overline{)76}$ 7). $7\overline{)98}$ 8). $6\overline{)90}$

9). $81 \div 3$ 10). $96 \div 6$ 11). $90 \div 5$ 12). $72 \div 4$

13). $5\overline{)820}$ 14). $4\overline{)852}$ 15). $3\overline{)618}$ 16). $9\overline{)936}$

17). $6\overline{)642}$ 18). $3\overline{)948}$ 19). $7\overline{)980}$ 20). $4\overline{)948}$

21). $892 \div 4$ 22). $627 \div 3$ 23). $984 \div 4$ 24). $980 \div 5$

25). $848 \div 8$ 26). $882 \div 6$ 27). $963 \div 9$ 28). $763 \div 7$

29). $3\overline{)7023}$ 30). $5\overline{)8420}$ 31). $6\overline{)6336}$ 32). $8\overline{)8784}$

33). $7\overline{)9506}$ 34). $9\overline{)9072}$ 35). $6\overline{)8808}$ 36). $8\overline{)9984}$

37). $9530 \div 5$ 38). $7476 \div 7$ 39). $9981 \div 9$ 40). $8472 \div 12$

41). $7896 \div 8$ 42). $9482 \div 11$ 43). $6276 \div 12$ 44). $6120 \div 6$

45). $5\overline{)81755}$ 46). $4\overline{)92268}$ 47). $6\overline{)66582}$ 48). $3\overline{)89619}$

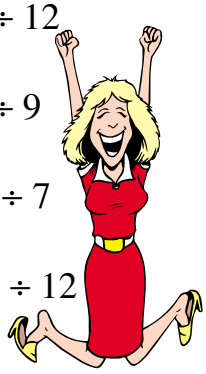
49). $7\overline{)83020}$ 50). $9\overline{)97254}$ 51). $8\overline{)96448}$ 52). $7\overline{)84028}$

53). $81252 \div 6$ 54). $76012 \div 4$ 55). $86886 \div 9$ 56). $72048 \div 12$

57). $91014 \div 7$ 58). $61854 \div 6$ 59). $78912 \div 8$ 60). $80154 \div 9$

61). $196224 \div 3$ 62). $118240 \div 5$ 63). $281238 \div 6$ 64). $670894 \div 7$

65). $325332 \div 9$ 66). $665301 \div 7$ 67). $725648 \div 8$ 68). $1180248 \div 12$



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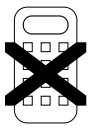
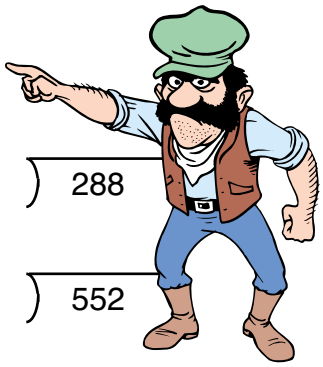
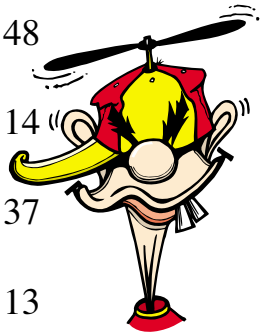


Long Division.



1). 12) 276	2). 13) 416	3). 12) 420	4). 18) 288
5). 15) 270	6). 21) 336	7). 19) 456	8). 24) 552
9). 12) 228	10). 17) 221	11). 13) 312	12). 14) 182
13). 15) 345	14). 16) 416	15). 14) 350	16). 19) 437
17). 18) 612	18). 23) 782	19). 17) 714	20). 28) 728
21). 17) 442	22). 23) 943	23). 26) 806	24). 32) 768
25). 33) 858	26). 25) 475	27). 32) 448	28). 31) 527
29). 44) 924	30). 26) 910	31). 33) 924	32). 52) 936
33). 41) 984	34). 29) 899	35). 36) 972	36). 27) 702
37). 62) 806	38). 71) 852	39). 54) 810	40). 83) 996

41). 882 ÷ 42	42). 936 ÷ 39	43). 784 ÷ 56	44). 979 ÷ 89
45). 841 ÷ 29	46). 833 ÷ 17	47). 874 ÷ 46	48). 962 ÷ 37
49). 936 ÷ 72	50). 864 ÷ 24	51). 891 ÷ 33	52). 848 ÷ 16
53). 938 ÷ 67	54). 672 ÷ 42	55). 754 ÷ 58	56). 912 ÷ 48
57). 925 ÷ 37	58). 448 ÷ 28	59). 784 ÷ 16	60). 826 ÷ 14
61). 884 ÷ 26	62). 935 ÷ 85	63). 966 ÷ 46	64). 666 ÷ 37
65). 770 ÷ 55	66). 782 ÷ 46	67). 980 ÷ 49	68). 663 ÷ 13



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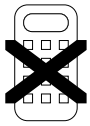
Long Multiplication and Division Problems.



1). Bottles of Lemonade are 64 p each. John needs 18 for a party. How much does he spend ?

2). There are 864 pupils and staff in a school. They all go to visit London on a school trip. How many 36 seat coaches do they need to hire ?

3). Drawing pins come in boxes of 48. The Mathematics Department orders 17 boxes, how many drawing pins have they ordered ?

4). A train carriage can hold 118 people. If a train has 14 carriages, how many people can it transport ?

5). A roadside florist sells only tulips. They cost 32p each. He takes £ 8.96 at the end of the day. How many tulips has he sold ?

6). Mandy the model maker is building a tank out of matches. Matches come in boxes of 52. She works out she needs 832 matches. How many boxes does she need to buy ?

7). Bobby thinks there is a Salad Cream shortage and goes shopping. Salad Cream comes in bottles weighing 285 g. He buys 42. How heavy is all the Salad Cream in grams ?

8). Jenny has a catering pack of tomato ketchup. It has 882 ml in it. Her job is to put it into tiny 18 ml sachets. How many sachets can she fill ?

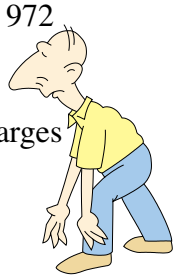
9). Milk is carried in crates which hold 24 bottles. A milk man sets off on his round with 142 full crates, all for delivery. How many bottles of milk is he delivering ?

10). Gemma is holding a Garden Party. She needs 6149 biscuits. A packet holds 43 biscuits.
   a). How many packets must she buy ?
   b). One packet costs 97p. How much is she going to spend on biscuits ?

11). Laura holds a raffle to raise money for local charities. She sells 36 tickets at £ 4.75 each.
   a). How much does she raise ?
   b). The money is to be shared equally between 25 charities. How much will each get ?

12). The new intake in a large school is 468. They are to be put into classes of 26 pupils each.
   a). How many classes are there to be ?
   b). Each pupil from the new intake pays 54p towards the School Fund.
   How much will the new intake contribute to the School Fund ?

13). The 36 workers from a chocolate factory go on a staff outing. The owner gives them 972 bars of chocolate for the journey.
   a). How many bars of chocolate do they get each ?
   b). Unfortunately it is a bumpy journey and everyone is sick! The coach driver charges them £ 88.20 to clear up the mess. How much do they each have to pay ?



14). A train holds 342 people. Each person paid £37 for a ticket.
   a). How much was paid in total for the tickets?
   b). The train company works out that on average each customer pays 87p for food from the Buffet Trolley. How much would the Buffet Trolley take on this journey ?

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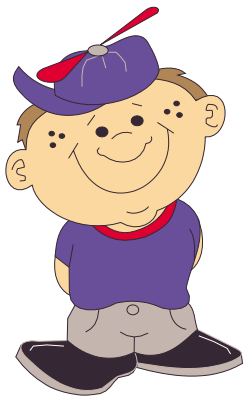
Real Life Problems.

1). Bottles of Cola are 44 p each. John needs as many as he can get. He has £6.50.
   a). How many can he buy ?
   b). How much change would he get back ?

2). There are 900 pupils and staff in a school. They all go to visit London on a school trip.
   a). How many 42 seat coaches do they need to hire ?
   b). How many spare seats will there be ?

3). Paperclips come in boxes of 52. The Mathematics Department needs 800 paperclips ?
   a). How many boxes do they need to buy?
   b). How many spare paperclips will there be ?



4). A train has 15 carriages, each carriage can hold up to 68 people. Bury F.C. wishes to take 905 football supporters to an away match.
   a). Will there be enough room on the train ? (Show working out).
   b). Calculate how too many/few seats there are?

5). A roadside florist sells only roses. They cost 28p each.
   a). A man asks for £5 worth. How many roses will he get ?
   b). How much change will he get ?

6). Fiona the model maker is building a ship out of matches. Matches come in boxes of 47. She works out she needs 980 matches.
   a). How many boxes does she need to buy ?
   b). How many spare matches will she have ?
   c). Each box of matches costs 36p. How much will Fiona spend on matches ?

7). Sarah has a catering pack of Salad Cream. It has 740 ml in it. Her job is to put it into tiny 23 ml sachets.
   a). How many sachets can she fill ?
   b). How much will she have left over ?
   c). The sachets are to be charged at 18p each. How much will she get for all the full sachets?

8). Hazel is holding a Garden Party. She needs 4000 biscuits. A packet holds 36 biscuits.
   a). How many packets must she buy ?
   b). How many extra biscuits will she have left ?
   c). One packet costs 54p. How much is she going to spend on biscuits ?

9). The new intake in a large school is 370. They are to be put into classes of 28 pupils each.
   a). How many classes are there to be ?
   b). If all the classes except the last one have 28 pupils in, how many will the last class have in it ?
   c). Each pupil from the new intake pays £1.25 towards the School Fund. How much will the new intake contribute to the School Fund ?

10). A train can hold 448 people. Each person on the train will pay £68 for a ticket.
   a). If the train is full, how much did all the tickets cost ?
   b). The train has 16 carriages, how many people will be in a carriage.
   c). For this journey there are only 328 passengers
      i). What is the least number of carriages the train would need ?
      ii). How many spare seats would there be ?

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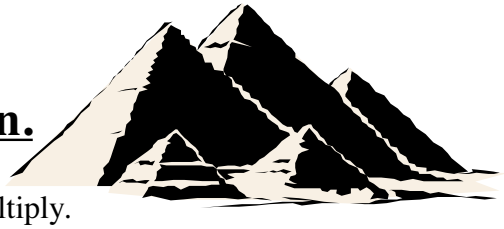
Egyptian Multiplication.



Here is a way the Egyptians used to multiply.

An easy example.

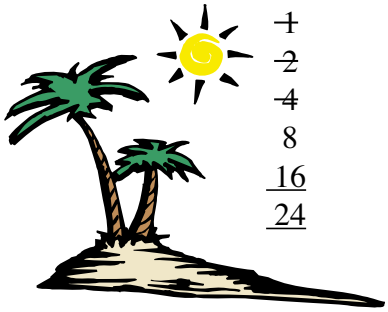
To solve 24 x 33

Write down a left and right column.

Left	Right
1	33
2	66
4	132
8	264
16	528

Put 1 in the left column and the bigger number of the sum in the right column.
Keep doubling both columns.....

until the number in the left column is more than half of the smaller number (24).



Left	Right	
~~1~~	~~33~~	
~~2~~	~~66~~	
~~4~~	~~132~~	
8	264	
16	528	+
24	**792**	

Now make the smaller number (24) by adding the numbers in the left column. Cross out any we don't need along with those in the right column.
Add up the numbers that haven't been crossed out in the right column and we have our answer.

24 x 33 = **792**.

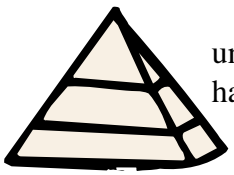
A Harder Example.

To solve 43 x 62

Write down a left and right column.

Left	Right
1	62
2	124
4	248
8	496
16	992
32	1984

Put 1 in the left column and the bigger number of the sum in the right column.
Keep doubling both columns.....



until the number in the left column is more than half of the smaller number (43).

Left	Right	
1	62	
2	124	
~~4~~	~~248~~	
8	496	
~~16~~	~~992~~	
32	1984	+
43	**2666**	

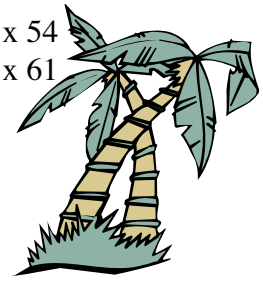
Now make the smaller number (43) by adding the numbers in the left column. Cross out any we don't need along with those in the right column.

Add up the numbers that haven't been crossed out in the right column and we have our answer.

43 x 62 = **2666**.

Use this method to solve

1).	12 x 41	2).	14 x 32	3).	17 x 68	4).	24 x 54
5).	25 x 35	6).	34 x 46	7).	41 x 53	8).	45 x 61
	Hard	9).	29 x 34	10).	55 x 72		



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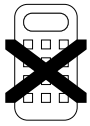
Russian Multiplication.



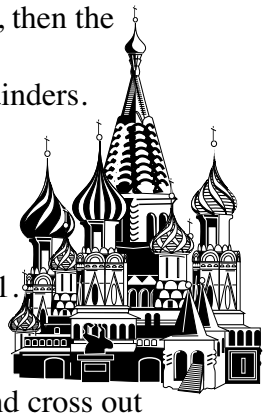
Here is a way the Russians used to multiply.

An easy example.

To solve 45 x 67

Small No.	Big No.	
45	67	
22	134	
11	268	
5	536	
2	1072	
1	2144	

Write down the smaller number first, then the bigger number.
Halve the small number-ignore remainders.
Double the big number column.



Stop when the small numbers reach 1.

Small No.	Big No.	
45	67	
~~22~~	~~134~~	
11	268	
5	536	
~~2~~	~~1072~~	
1	2144	+
	3015	

Look in the small number column and cross out any numbers that are even numbers. Cross out the number on the same level in the Big number column.

Add up the numbers that haven't been crossed out in the big number column and we have our answer.

45 x 67 = **3015**.

A Harder Example.

To solve 216 x 73

Small No.	Big No.	
73	216	
36	432	
18	864	
9	1728	
4	3456	
2	6912	
1	13824	

Write down the smaller number first, then the bigger number.
Halve the small number-ignore remainders.
Double the big number column.

Stop when the small numbers reach 1.

Small No.	Big No.	
73	216	
~~36~~	~~432~~	
~~18~~	~~864~~	
9	1728	
~~4~~	~~3456~~	
~~2~~	~~6912~~	
1	13824	+
	15768	

Look in the small number column and cross out any numbers that are even numbers. Cross out the number on the same level in the Big number column.

Add up the numbers that haven't been crossed out in the big number column and we have our answer.

216 x 73 = **15768**.

Use this method to solve

1).	24 x 36	2).	19 x 53	3).	39 x 33	4).	57 x 42
5).	37 x 78	6).	36 x 67	7).	41 x 53	8).	82 x 54
	Hard	9).	29 x 134	10).	85 x 172		

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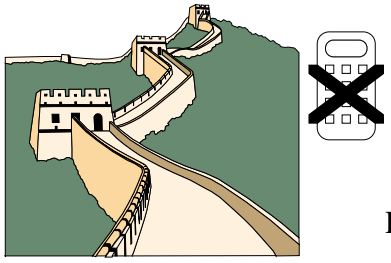
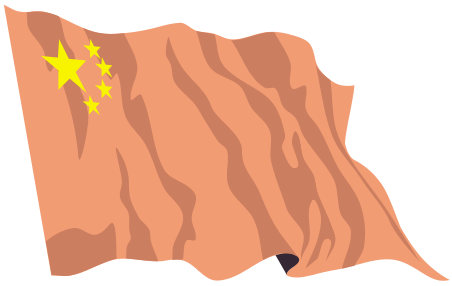


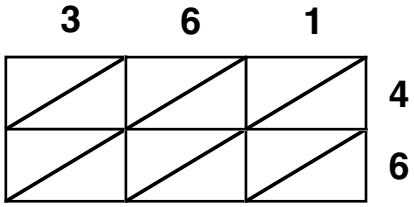
Chinese Multiplication.



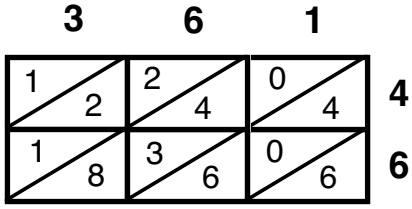
Here is a way the Chinese used to multiply.

An easy example. Solve 361 x 46.

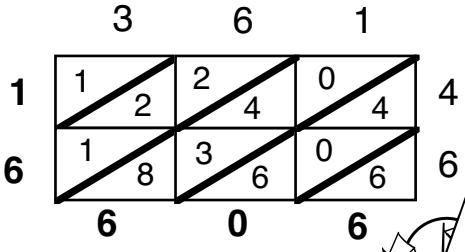
A). Write the numbers along the top and down the right hand side of a rectangular grid as shown.



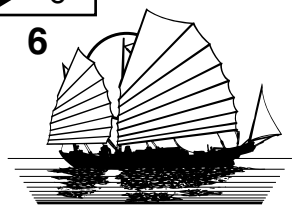
B). Each pair is multiplied out and the answer put in the relevant box. The tens in the top half and units in the bottom half.



C). The numbers are added up diagonally, starting just with the 6.
The next is 4 + 0 + 6 = 10. The 0 is put down and the 1 carried to the next diagonal to be added up.

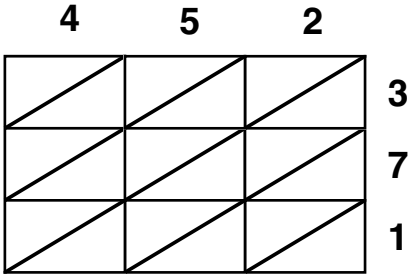


D). This is now read from the 1. 361 x 46 = **16606**.

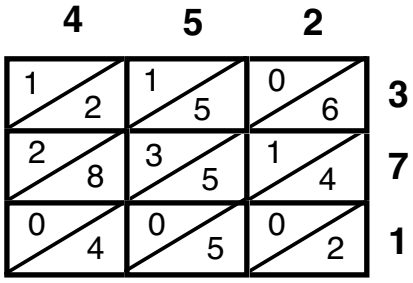


A hard example. Solve 452 x 371.

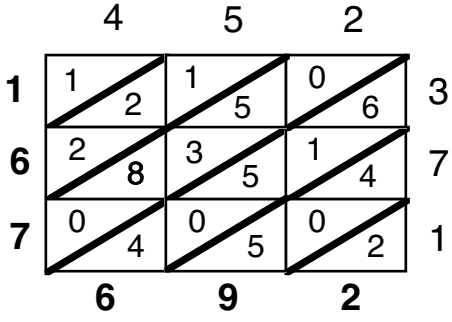
A). Write the numbers along the top and down the right hand side of a rectangular grid as shown.



B). Each pair is multiplied out and the answer put in the relevant box.



C). The numbers are added up diagonally, starting in the bottom right corner.
Remember to carry.



D). Read off the answer.

452 x 371 = **167692**.

Try answering these using this method.

1).	361 x 46	2).	264 x 54	3).	648 x 49	4).	518 x 73
5).	327 x 98	6).	676 x 57	7).	941 x 83	8).	892 x 74
	Hard	9).	219 x 134	10).	835 x 472		

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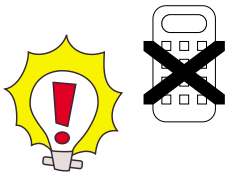
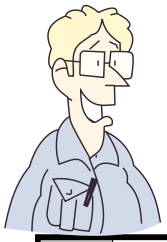
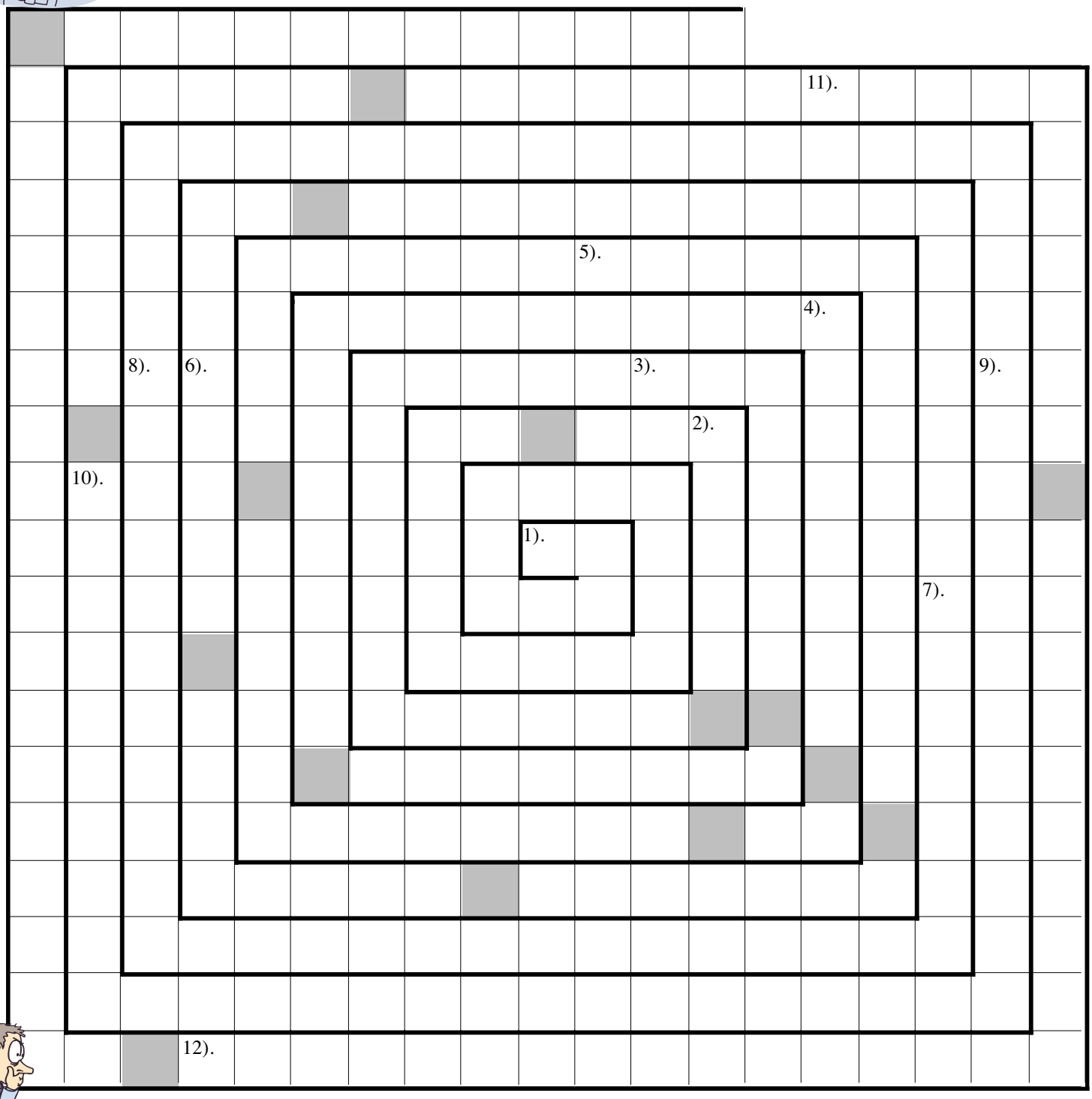


Spiralling Sums 1 (Long Multiplication).

Work out and then write in the answers to the following:



1). 16 x 23 = _____ 2). 16 x 51 = _____ 3). 58 x 42 = _____
4). 73 x 36 = _____ 5). 94 x 57 = _____ 6). 39 x 16 = _____
7). 69 x 45 = _____ 8). 34 x 29 = _____ 9). 97 x 86 = _____
10). 48 x 19 = _____ 11). 124 x 43 = _____ 12). 215 x 29 = _____



13). Start at the centre of the spiral and write out the answers in words in the appropriate places.
14). Hidden in the spiral are **three** mystery countries. To find the countries read off the letters in the shaded squares starting at the centre of the spiral.

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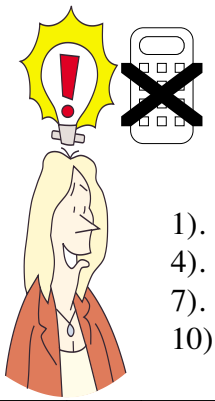
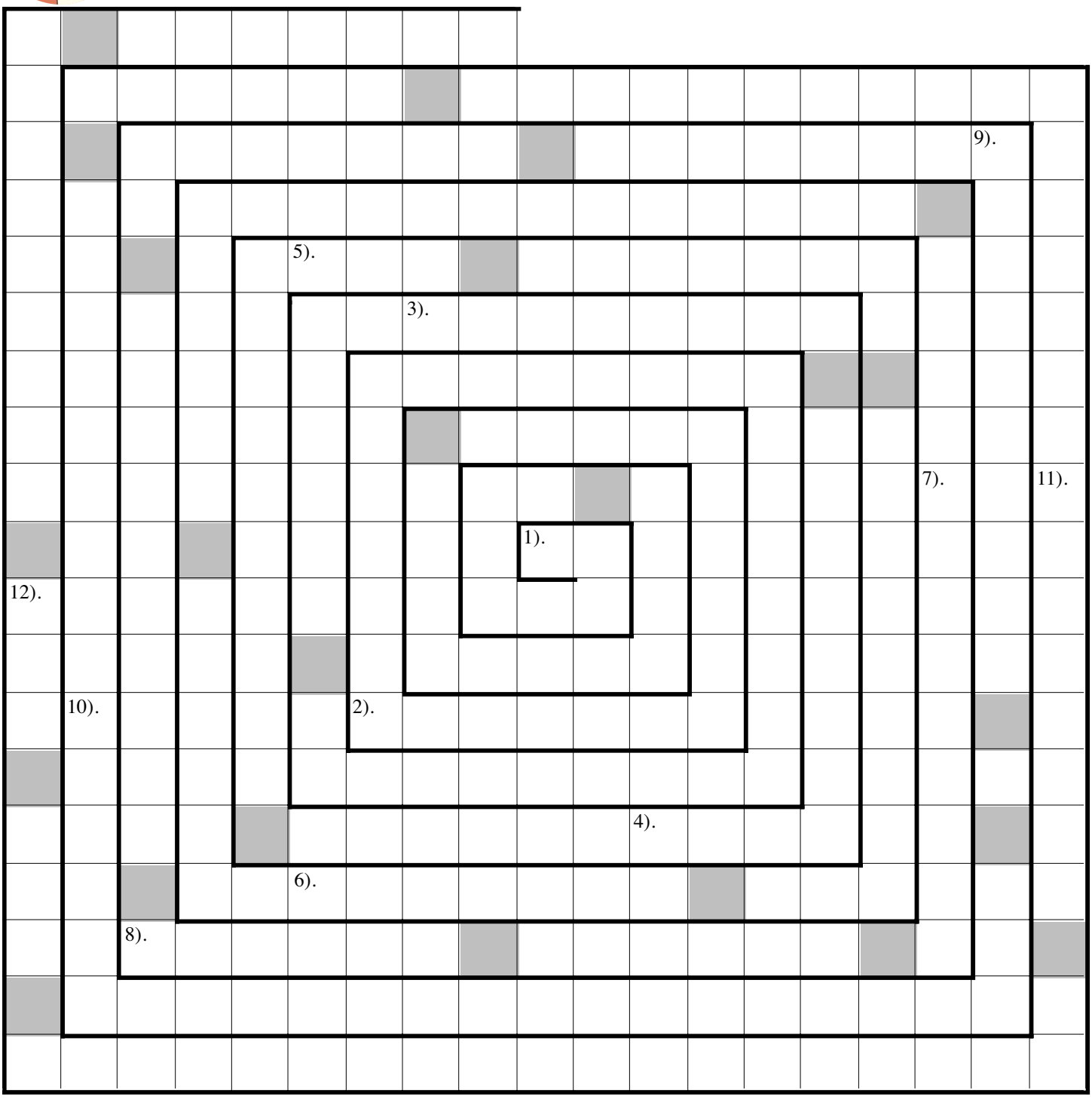


Spiralling Sums 2 (Long Multiplication).

Work out and then write in the answers to the following:

1). 42 x 57 = _____ 2). 36 x 94 = _____ 3). 15 x 42 = _____
4). 26 x 31 = _____ 5). 95 x 72 = _____ 6). 83 x 74 = _____
7). 16 x 51 = _____ 8). 47 x 32 = _____ 9). 68 x 54 = _____
10). 85 x 37 = _____ 11). 117 x 39 = _____ 12). 242 x 25 = _____



13). Start at the centre of the spiral and write out the answers in words in the appropriate places.
14). Hidden in the spiral are **three** mystery countries. To find the countries read off the letters in the shaded squares starting at the centre of the spiral.

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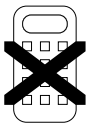
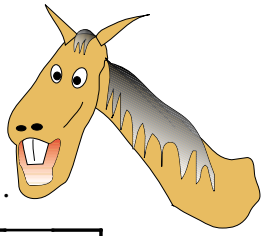
The Number Six Multiple Maze.



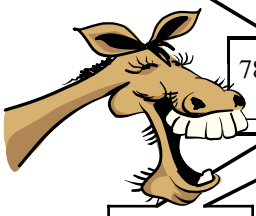


Zeb has lost her stripes. She has to get through the maze to find them.
She can only travel along **multiples of 6**.
Work out each sum. Now find the route she must take to find her stripes.

IN

35 + 55 = | 174 + 54 = | 212 - 44 = | 158 + 58 = | 216 - 66 =

112 - 76 = | 213 - 137 = | 146 + 74 = | 171 - 123 = | 229 - 83 = | 108 + 222 =



78 + 156 = | 295 - 181 = | 78 + 48 = | 314 - 96 = | 133 + 47 =

241 - 157 = | 87 + 113 = | 219 - 191 = | 250 - 64 = | 333 - 279 = | 54 + 46 =

318 - 260 = | 97 + 171 = | 47 + 175 = | 215 + 137 = | 400 - 34 =

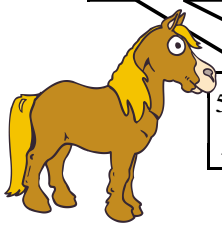
230 - 82 = | 415 - 343 = | 128 + 268 = | 79 + 159 = | 241 - 155 = | 97 + 81 =

346 - 226 = | 163 - 75 = | 114 + 148 = | 137 + 115 = | 68 + 136 =

117 + 123 = | 97 + 243 = | 175 + 239 = | 212 - 116 = | 343 - 233 = | 249 + 111 =

207 + 147 = | 127 + 179 = | 420 - 116 = | 94 + 82 = | 237 + 183 =

421 - 355 = | 347 - 145 = | 280 - 168 = | 64 + 234 = | 471 - 369 = | 125 + 177 =



532 - 424 = | 293 + 49 = | 178 + 68 = | 517 - 257 = | 111 + 279 =

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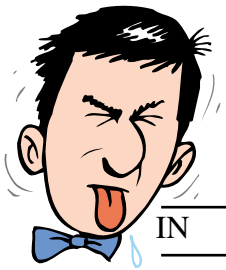
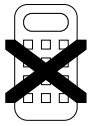
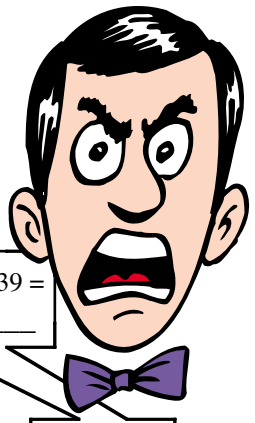
The Number Seven Multiple Maze.

Eric has lost his marbles. He has to get through the maze to find them.
He can only travel along **multiples of 7**.
Work out each sum. Now find the route he must take to regain his sanity!







IN

124 - 75 = | 39 + 171 = | 145 - 75 = | 237 + 106 = | 139 + 239 =

150 - 24 = | 119 + 181 = | 67 + 108 = | 313 - 63 = | 217 - 163 = | 73 + 165 =

346 - 253 = | 106 - 43 = | 17 + 68 = | 236 + 114 = | 400 - 36 =

157 + 63 = | 312 - 67 = | 431 - 364 = | 99 + 197 = | 357 - 222 = | 59 + 18 =

263 - 164 = | 138 + 268 = | 138 - 96 = | 74 + 59 = | 200 - 58 =

79 + 125 = | 313 - 229 = | 87 + 83 = | 143 + 75 = | 463 - 407 = | 243 + 117 =

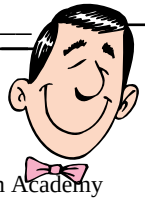
64 + 125 = | 108 + 216 = | 94 + 74 = | 300 - 41 = | 39 + 59 =

147 + 77 = | 59 + 51 = | 116 + 213 = | 246 - 95 = | 346 - 223 = | 37 + 133 =

65 + 117 = | 421 - 265 = | 530 - 439 = | 178 + 74 = | 139 + 309 =

137 + 283 = | 415 - 149 = | 109 + 309 = | 527 - 385 = | 47 + 91 = | 65 + 47 =

419 - 372 = | 521 - 416 = | 117 + 191 = | 420 - 243 = | 279 + 176 =



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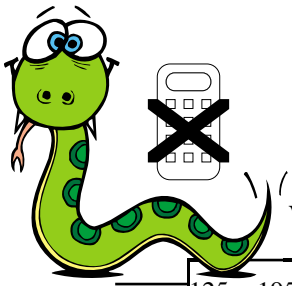
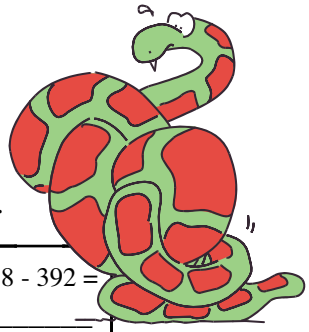


The Number Eight Multiple Maze.

Sammy has lost his rattle. He has to get through the maze to find it.
He can only travel along **multiples of 8**.
Work out each sum. Now find the route he must take to find his rattle.



IN

125 + 195 = | 130 - 58 = | 65 + 367 = | 250 - 203 = | 408 - 392 =

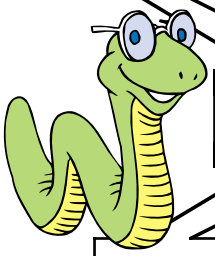
211 - 179 = | 35 + 49 = | 523 - 488 = | 97 + 127 = | 391 - 269 = | 63 + 177 =

282 - 218 = | 76 + 132 = | 420 - 50 = | 38 + 58 = | 531 - 419 =

263 - 183 = | 54 + 126 = | 216 + 115 = | 432 - 392 = | 200 - 126 = | 137 + 223 =

61 + 67 = | 240 - 181 = | 106 + 182 = | 149 + 295 = | 42 + 88 =

416 - 382 = | 400 - 168 = | 74 + 91 = | 273 - 249 = | 132 + 284 = | 613 - 545 =

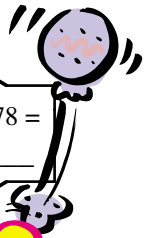


104 + 123 = | 200 - 22 = | 147 + 183 = | 430 - 277 = | 75 + 45 =

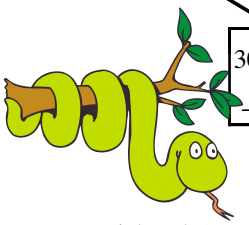
472 - 425 = | 57 + 103 = | 254 - 206 = | 124 + 212 = | 600 - 248 = | 34 + 245 =

550 - 94 = | 161 - 37 = | 200 -8 = | 234 + 227 = | 197 - 109 =

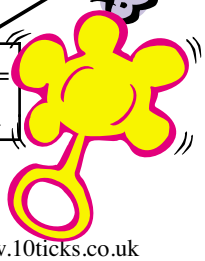
113 + 153 = | 347 - 291 = | 116 + 166 = | 500 - 39 = | 637 - 420 = | 451 - 378 =



309 + 117 = | 49 + 207 = | 631 - 431 = | 242 - 138 = | 137 + 343 =



OUT



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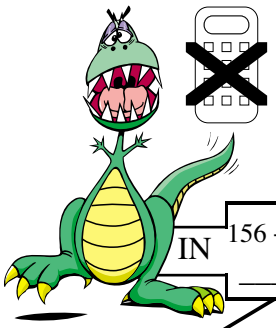
The Number Nine Multiple Maze.

Dino has lost his saw. He has to get through the maze to find it.
He can only travel along **multiples of 9**.
Work out each sum. Now find the route he must take to find his saw.



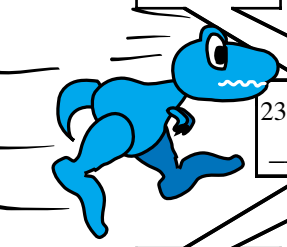
IN

156 + 258 = | 94 - 76 = | 31 + 68 = | 304 - 124 = | 65 + 88 =

428 - 113 = | 39 + 145 = | 500 - 206 = | 214 + 86 = | 75 + 129 = | 472 - 238 =

112 - 58 = | 497 - 371 = | 105 + 174 = | 365 - 282 = | 79 + 361 =

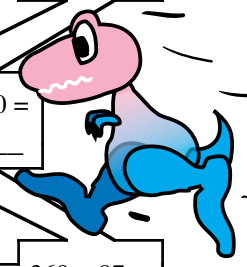
294 - 213 = | 605 - 422 = | 217 + 176 = | 451 - 262 = | 81 + 63 = | 119 + 128 =



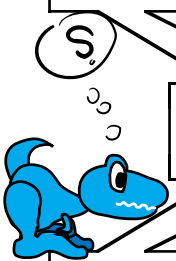
238 + 158 = | 420 - 218 = | 525 - 426 = | 59 + 177 = | 532 - 469 =

144 + 18 = | 407 - 323 = | 177 + 129 = | 694 - 637 = | 53 + 217 = | 204 - 75 =

64 + 156 = | 613 - 504 = | 338 - 257 = | 523 - 486 = | 416 - 110 =



79 + 106 = | 167 + 328 = | 200 - 65 = | 614 - 379 = | 48 + 338 = | 369 + 87 =

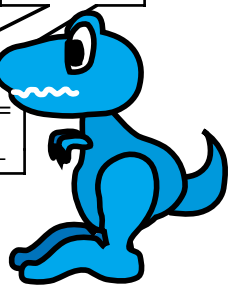


500 - 248 = | 65 + 62 = | 393 - 192 = | 138 + 159 = | 637 - 466 =

542 - 470 = | 350 - 265 = | 108 + 333 = | 709 - 673 = | 507 - 187 = | 370 + 116 =

436 - 256 = | 700 - 376 = | 79 + 49 = | 620 - 324 = | 740 - 407 =

OUT



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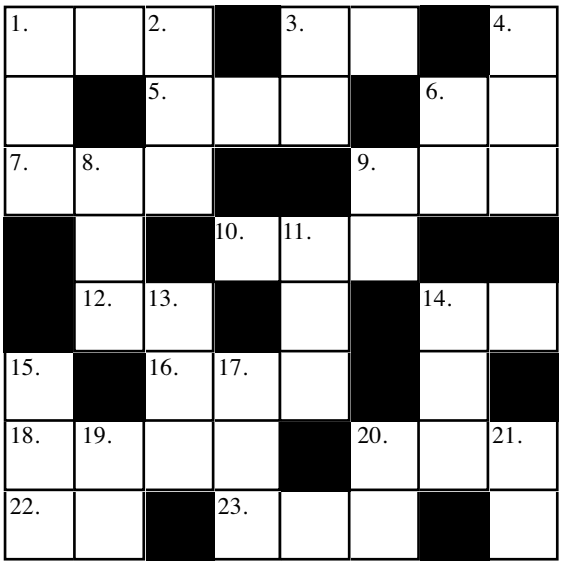
Multiplication and Division Cross-Numbers.

Work out the answers either in your head or by using a pen and paper method. Put these answers in the cross-number.

A).



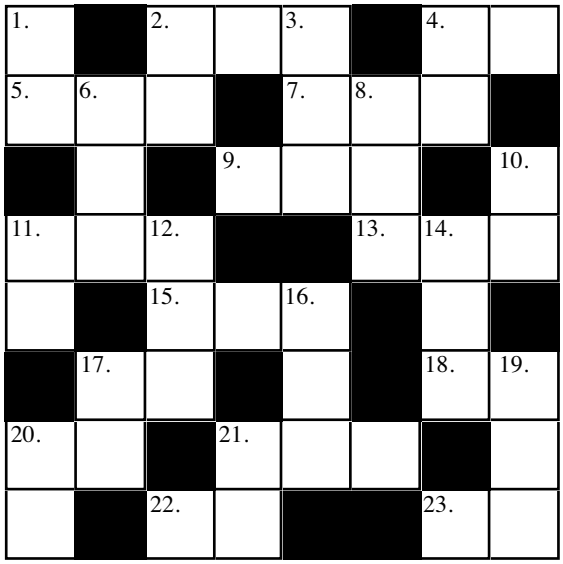
Across.

1). 16 x 8
3). 455 ÷ 13
5). 19 x 46
6). 966 ÷ 23
7). 18 x 16
9). 13 x 37
10). 14 x 16
12). 9 x 9
14). 603 ÷ 9
16). 68 x 7
18). 98 x 29
20). 13 x 13
22). 1056 ÷ 44
23). 63 x 14

Down.

1). 12 x 11
2). 37 x 24
3). 714 ÷ 21
4). 11 x 11
6). 6 x 8
8). 36 x 23
9). 748 ÷ 17
11). 46 x 6
13). 12 x 12
14). 56 x 11
15). 14 x 23
17). 56 x 13
19). 7 x 12
20). 144 ÷ 12
21). 665 ÷ 7

B).



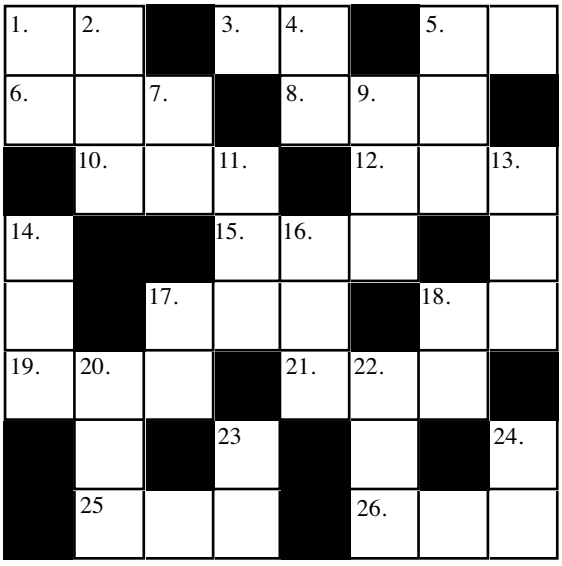
Across.

2). 36 x 21
4). 247 ÷ 13
5). 13 x 14
7). 24 x 39
9). 13 x 13
11). 12 x 9
13). 17 x 41
15). 94 x 9
17). 768 ÷ 32
18). 448 ÷ 7
20). 715 ÷ 65
21). 25 x 18
22). 969 ÷ 51
23). 1876 ÷ 67

Down.

1). 369 ÷ 9
2). 9 x 8
3). 87 x 8
4). 128 ÷ 8
6). 58 x 15
8). 44 x 9
10). 378 ÷ 14
11). 910 ÷ 65
12). 68 x 13
14). 21 x 46
16). 45 x 15
17). 252 ÷ 12
19). 6 x 68
20). 688 ÷ 43
21). 686 ÷ 14

C).



Across.

1). 391 ÷ 23
3). 506 ÷ 22
5). 230 ÷ 5
6). 68 x 14
8). 18 x 18
10). 21 x 21
12). 39 x 3
15). 47 x 20
17). 79 x 11
18). 296 ÷ 8
19). 27 x 19
21). 13 x 32
25). 16 x 13
26). 38 x 18

Down.

1). 152 ÷ 8
2). 29 x 26
4). 528 ÷ 16
5). 49 x 9
7). 768 ÷ 32
9). 15 x 14
11). 14 x 14
13). 67 x 11
14). 43 x 15
16). 26 x 19
17). 581 ÷ 7
18). 612 ÷ 17
20). 38 x 4
22). 18 x 7
23). 950 ÷ 25
24). 504 ÷ 36

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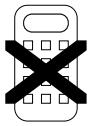
Prime Numbers 1.



Multiples.

A). Write out the first six multiples of the following numbers:-

1). 4	2). 7	3). 5	4). 3	5). 8
6). 12	7). 15	8). 9	9). 11	10). 20
11). 31	12). 45	13). 80	14). 57	15). 123

Factors.

B). Write out the complete set of factors, in ascending order, of the following numbers:-

1). 6	2). 10	3). 5	4). 9	5). 2
6). 12	7). 1	8). 4	9). 16	10). 20
11). 8	12). 35	13). 18	14). 24	15). 30
16). 44	17). 37	18). 52	19). 64	20). 120

Copy the following table, and **complete it up to 30**.

Number	Factors	No. of Factors
1	1	1
2	1,2	2
3	1,3	2
4	1,2,4	3

Which of the following numbers are **prime numbers**.

C). 1). 18	2). 19	3). 5	4). 9	5). 21
6). 12	7). 1	8). 3	9). 15	10). 2
11). 17	12). 33	13). 55	14). 24	15). 35
16). 31	17). 37	18). 51	19). 64	20). 41
21). 29	22). 45	23). 59	24). 81	25). 87

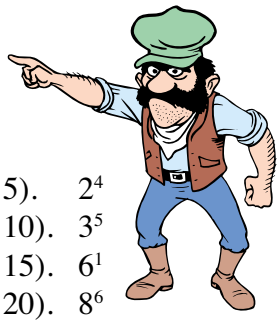
Index Numbers (Powers).

D). We say 3^5 as "three to the power five".

Write out how we say the following :-

1). 5^4	2). 8^2	3). 9^4	4). 6^3	5). 2^4
6). 6^9	7). 7^6	8). 8^5	9). 12^7	10). 3^5

E). 3^5 means 3 x 3 x 3 x 3 x 3



Write out the meanings of the following :-

1). 4^5	2). 7^2	3). 5^4	4). 9^3	5). 2^4
6). 6^2	7). 4^6	8). 8^3	9). 12^2	10). 3^5
11). 8^4	12). 2^7	13). 14^3	14). 10^6	15). 6^1
16). 12^5	17). 9^2	18). 20^4	19). 2^1	20). 8^6

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F). When a question asks you to **evaluate** it, it means find a value.

Evaluate 4^2 . 4^2 means $4 \times 4 = \underline{\mathbf{16}}$.

Evaluate the following :-

1). 7^2	2). 3^2	3). 2^3	4). 9^2	5). 2^4
6). 6^2	7). 5^3	8). 8^2	9). 12^2	10). 3^3
11). 8^3	12). 2^5	13). 11^2	14). 10^3	15). 6^4
16). 10^4	17). 9^1	18). 10^6	19). 2^1	20). 5^4
21). 7^3	22). 18^1	23). 6^7	24). 9^5	25). 4^7

G). By evaluating the powers, which of these is the bigger number ?

1). 2^3 or 5^2	2). 7^2 or 4^3	3). 3^3 or 5^2	4). 4^3 or 6^2
5). 2^4 or 4^2	6). 5^3 or 10^2	7). 6^3 or 12^2	8). 8^2 or 4^3
9). 7^3 or 13^2	10). 8^3 or 15^2	11). 9^3 or 5^4	12). 7^4 or 12^3
13). 21^3 or 10^4	14). 6^4 or 5^5	15). 7^5 or 3^8	16). 2^7 or 4^4
17). 3^5 or 7^3	18). 2^8 or 4^4	19). 4^5 or 8^3	20). 6^5 or 5^6

Square and Cube Numbers.

H). Numbers that have a power of 2 are called **square** numbers. 4^2 is said "4 squared".
Numbers that have a power of 3 are called **cube** numbers. 4^3 is said "4 cubed".

Copy and complete the table up to 20^2 and 20^3.

		Square number			Cube number
1^2 2^2 3^2	1 x 1 2 x 2 3 x 3	1 4	1^3 2^3 3^3	1 x 1 x 1 2 x 2 x 2 3 x 3 x 3	1 8

I). List all the factors of each square number, what do you notice ?
Why ?

Square Roots and Cube Roots.

J). The opposite process of squaring a number is **square rooting** a number ($\sqrt{\ }$).
Similarly, the opposite process of cubing a number is **cube rooting** a number ($\sqrt[3]{\ }$).

From your knowledge of squares and cubes, work out the following.

1). $\sqrt{16}$	2). $\sqrt{64}$	3). $\sqrt[3]{8}$	4). $\sqrt[3]{64}$	5). $\sqrt{4}$
6). $\sqrt[3]{27}$	7). $\sqrt[3]{1}$	8). $\sqrt{1}$	9). $\sqrt[3]{125}$	10). $\sqrt{100}$
11). $\sqrt[3]{343}$	12). $\sqrt{9}$	13). $\sqrt[3]{729}$	14). $\sqrt{25}$	15). $\sqrt[3]{216}$
16). $\sqrt{144}$	17). $\sqrt{121}$	18). $\sqrt[3]{512}$	19). $\sqrt{36}$	20). $\sqrt{81}$
21). $\sqrt[3]{1331}$	22). $\sqrt{169}$	23). $\sqrt{225}$	24). $\sqrt[3]{2744}$	25). $\sqrt{324}$
26). $\sqrt{169}$	27). $\sqrt[3]{1000}$	28). $\sqrt{361}$	29). $\sqrt[3]{5832}$	30). $\sqrt[3]{8000}$

Prime Numbers 2.

Prime Factors.

Reminder. Prime Numbers : 2, 3, 5, 7, 11, 13, 17.....

This is how we find the prime factors of a number.
E.g. Find the prime factors of 120.

2	120
	60

2	120
2	60
	30

2	120
2	60
2	30
3	15
5	5
	1

Start by finding the smallest prime number that will divide into the number. Divide it!

Now find the smallest prime number that will divide into the answer. Divide it!

Keep dividing the answers by the smallest prime number. Stop when you reach 1.

Prime factors of 120 are **2 x 2 x 2 x 3 x 5**.

A. Now find the prime factors of these numbers.

1). 8	2). 10	3). 20	4). 28	5). 36
6). 24	7). 30	8). 45	9). 40	10). 42
11). 80	12). 54	13). 64	14). 96	15). 84
16). 99	17). 81	18). 88	19). 108	20). 112
21). 168	22). 384	23). 360	24). 216	25). 462

B. Leave the following in index notation.

e.g. 2 x 2 x 2 x 5 = **2^3 x 5**

1). 2 x 3 x 3	2). 2 x 3 x 3 x 5	3). 2 x 2 x 2 x 5	4). 2 x 3 x 3 x 3
5). 3 x 5 x 5 x 5	6). 2 x 5 x 5 x 7	7). 3 x 5 x 5 x 5	8). 5 x 5 x 5 x 5 x 7
9). 2 x 5 x 7 x 7 x 7	10). 3 x 5 x 5 x 7 x 7	11). 5 x 5 x 7 x 7 x 7	12). 2 x 2 x 2 x 5 x 7 x 7
13). 2 x 2 x 3 x 3 x 13	14). 5 x 5 x 7 x 13 x 13	15). 2 x 5 x 7 x 13 x 13	16). 3 x 3 x 3 x 3 x 5 x 5
17). 2 x 2 x 2 x 3 x 3 x 5 x 5	18). 2 x 3 x 3 x 5 x 5 x 5 x 5	19). 2 x 5 x 7 x 7 x 7 x 7	20). 2 x 5 x 5 x 5 x 5 x 5

C. E.g. Find prime factors of 140, leave in index notation.

Prime factors are 2 x 2 x 5 x 7

= 2^2 x 5 x 7

2	140
2	70
5	35
7	7
	1

Find the prime factors of the following. **Leave in index notation**.

1). 12	2). 18	3). 16	4). 44	5). 50
6). 27	7). 25	8). 56	9). 32	10). 75
11). 72	12). 63	13). 100	14). 180	15). 308
16). 216	17). 175	18). 288	19). 270	20). 486

D. These numbers have been left in index notation. Find which numbers they are.

1). 2^2 x 5	2). 3^2 x 7	3). 2^2 x 13	4). 3^2 x 5
5). 2^2 x 3^2	6). 2^3 x 3	7). 2 x 3^2	8). 2^3 x 7
9). 2 x 3^3	10). 2^3 x 3^2	11). 3 x 5^2	12). 2 x 7^2
13). 3^2 x 5^2	14). 2 x 3 x 5^2	15). 2^2 x 3^2 x 7	16). 2^3 x 7 x 11
17). 3^2 x 5^3	18). 3 x 7^2	19). 2^2 x 3^2 x 5^2	20). 2^3 x 3^3 x 7^2

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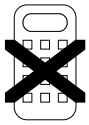
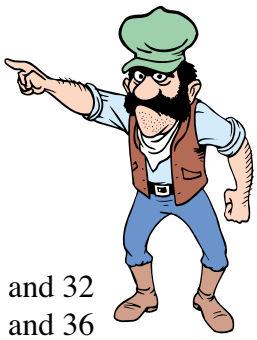
Highest Common Factor (H.C.F.).



A. The H.C.F. of two or more numbers is the biggest factor that belongs to all the numbers.
One way to find this is to look at the prime factors.
E.g. Find the H.C.F. of 12 and 18.

Prime factors of 12 - **2** x 2 x **3** These factors belong in both sets.
Prime factors of 18 - **2** x 3 x **3**

The H.C.F is 2 x 3 = 6.

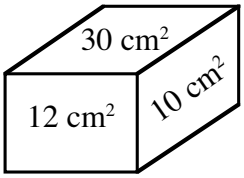


Find the H.C.F. of the following sets of numbers.

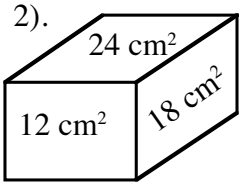
1).	12 and 18	2).	10 and 25	3).	14 and 21	4).	24 and 32
5).	30 and 24	6).	30 and 45	7).	48 and 36	8).	45 and 36
9).	48 and 72	10).	42 and 70	11).	105 and 63	12).	72 and 120
13).	18, 30 and 42	14).	24, 40 and 72	15).	27, 18 and 99	16).	104, 72 and 56
17).	36, 96 and 60	18).	42, 56 and 98	19).	90, 45 and 105	20).	36, 63 and 108
21).	63, 42 and 126	22).	108, 54 and 90	23).	72, 168 and 120	24).	144, 96 and192.

B. Here are some cuboids. The areas of each face are given. (The diagrams are not drawn to scale).
Work out the length, width and height of each cuboid.

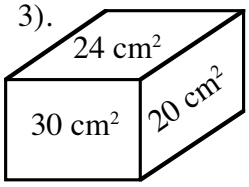
1).



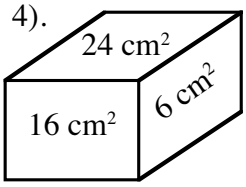
2).



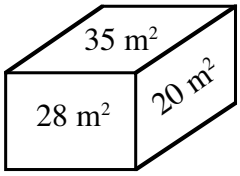
3).



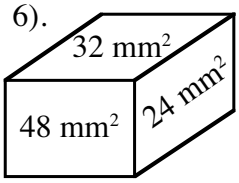
4).



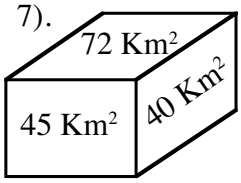
5).



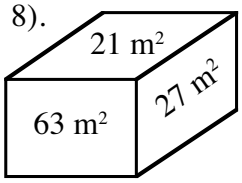
6).



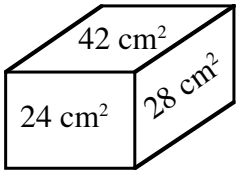
7).



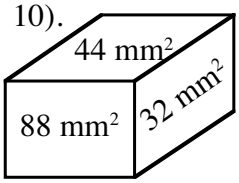
8).



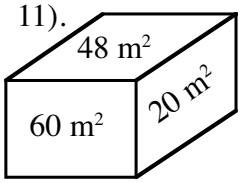
9).



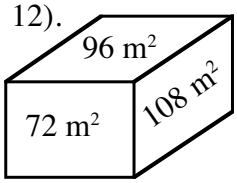
10).



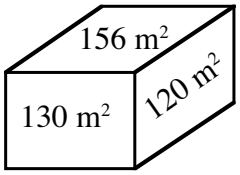
11).



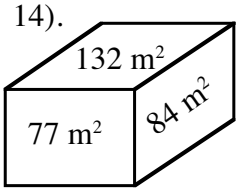
12).



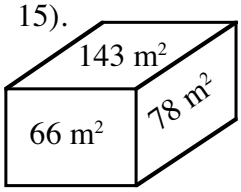
13).



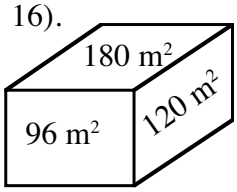
14).



15).



16).



Lowest Common Multiple (L.C.M.).

The smallest multiple of two or more numbers is called the Lowest Common Multiple (L.C.M.).
E.g. Find the L.C.M. of 4 and 9.

Multiples of 4 : 4, 8, 12, 16, 20, 24, 28, 32, **36**, 40 ....
Multiples of 9 : 9, 18, 27, **36**, 45.....

The L.C.M. of 4 and 9 is 36.

Find the Lowest Common multiple of the following sets of numbers.

1).	3 and 4	2).	5 and 7	3).	6 and 9	4).	4 and 7
5).	8 and 12	6).	10 and 15	7).	12 and 9	8).	10 and 12
9).	20 and 15	10).	12 and 18	11).	15 and 25	12).	16 and 24
13).	3, 4 and 5	14).	2, 3 and 5	15).	3, 4 and 8	16).	2, 4 and 9
17).	5, 8 and 10	18).	3, 9 and 12	19).	4, 12 and 16	20).	8, 12 and 20
21).	5, 12 and 24	22).	15, 20 and 24	23).	8, 15 and 20	24).	15, 18 and 30.

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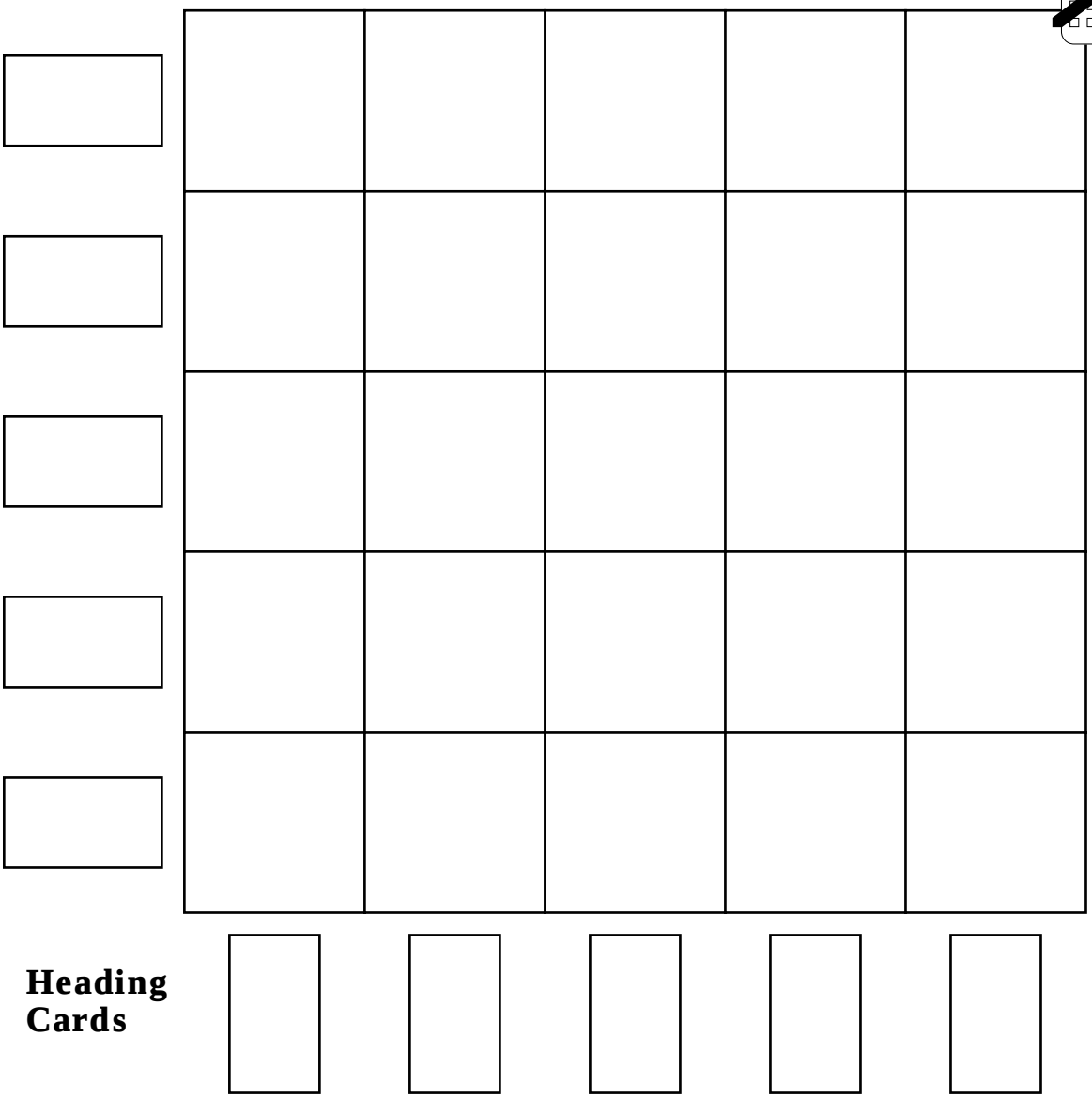
The Factors and Multiples Game

The Playing Board



Heading Cards

Rules.

1. Cut out the Heading Cards and place one in each of the ten spaces around the playing board.

2. Cut out the 25 Number Cards and place each one on the playing board, so it satisfies the condition given by the Heading Cards for each

3. By re-arranging the positions of the Heading Cards and the Number Cards, try to fill in as many squares on the playing board as possible.

Heading Cards

Prime Numbers	Square Numbers
Factors of 126	Factors of 60
Numbers less than 13	Numbers more than 12
Multiples of 3	Multiples of 5
Odd Numbers	Even Numbers

Number Cards

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	20	21
24	25	27	30	60

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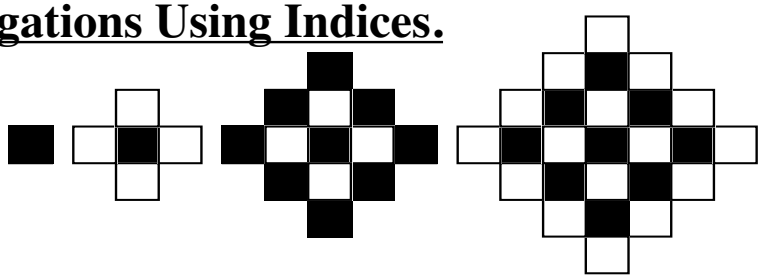
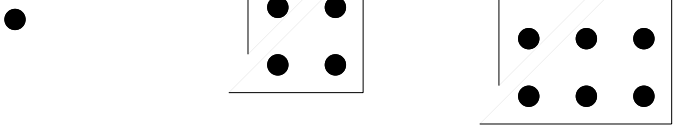
Investigations Using Indices.



1). a). Copy this pattern on squared paper.
b). Continue the pattern by drawing the next three diagrams.
c). Investigate the number of shaded and unshaded squares in each diagram.

2). A chessboard is made up of 8 squares by 8 squares.
a). How many small squares are on this board ?
b). How many squares of size 2 x 2 are on this board ?
c). How many squares of **any size** are on this board ?
d). How many squares of any size are on a board of dimensions
i). 4 x 4; ii). 6 x 6; iii). 10 x 10; iv). 20 x 20 ?

3).



1 1 + 3 = **4** 3 + 6 = **9**

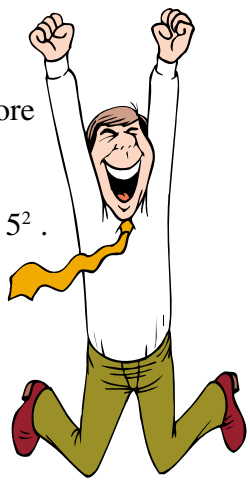
a). Copy the pattern. Draw the next 3 in this sequence and write in the pattern of numbers.
b). What type of numbers are i). in bold, ii). the other numbers ?
c). Write an explanation of how you can make square numbers from triangular numbers.

4). Write out the first 30 square numbers.
a). Look at the last digit of these numbers. What pattern do you notice?
b). Which numbers don't appear as a last digit of a square number ?
c). Could these numbers be a square number i). 723 ii). 1412 ?

5). Some numbers can be represented as the difference between two square numbers.
(One square number take away another square number).

$21 = 5^2 - 2^2$ $65 = 9^2 - 4^2$

a). There are 22 numbers up to **30** that can be written in this way. Find them.
b). Which whole numbers up to 30 **cannot** be represented this way ?
c). Which numbers up to 30 can be expressed as the difference of two squares in more than one way ?



6). a). Some numbers are equal to the sum of 2 square numbers. e.g. **34** = $3^2 + 5^2$.
Which numbers up to 100 can be written as the sum of two square numbers?
b). Every whole number is the sum of **not more than five** square numbers.

e.g. $1 = 1^2$ $2 = 1^2 + 1^2$ $3 = 1^2 + 1^2 + 1^2$
$4 = 2^2$ $5 = 2^2 + 1^2$

Investigate whether this is true or not.

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7). a). Pick a number ! **Say 23**.

b). Square each digit and **add** the results together. $2^2 + 3^2 = 4 + 9 = 13$

c). Use the new number and do the same again.... 13 $1^2 + 3^2 = 1 + 9 = 10$

d). If you reach 1 you have a **happy number**. 10 $1^2 + 0^2 = 1 + 0 = 1$

The 23 chain is **23 ☛ 13 ☛ 10 ☛ 1**.

e). **Sad numbers** are those that do not go to 1.

f). Put all the numbers up to 50 into your chains! Which are happy, which are sad?

8). a). Pick any 2 digit number ! **Say 95**

b). Square each digit and **subtract** the smaller . from the larger. $9^2 - 5^2 = 81 - 25 = 56$

$6^2 - 5^2 = 36 - 25 = 11$

c). Use the new number and do the same again.... $1^2 - 1^2 = \mathbf{0}$

d). If the answer goes to 0 it is a **sneaky number**.

The 95 chain is **95 ☛ 56 ☛ 11 ☛ 0**

e). **Loopy numbers** are those that do not go to 0.

f). Find for all the numbers up to 50 which are **sneaky** and which are **loopy**.

9). a). Pick a two digit number ! **Say 42**.

b). **Cube** each digit and **add** the results together. $4^3 + 2^3 = 64 + 8 = 72$

c). Use the new number and do the same again.... 72 $7^3 + 2^3 = 343 + 8 = 351$

351 $3^3 + 5^3 + 1^3 = 27 + 125 + 1 = 153$

The 42 chain so far is **42 ☛ 72 ☛ 351 ☛ 153**.

d). Keep repeating this process. What happens ?

e). Try it with numbers that are one **less** than the three times table. What happens ?

f). Try it with numbers that are one **more** than the three times table. What happens ?

10). Draw Pascal's triangle and add each row. What connection with powers does it have?

11). You are given distance targets as sponsorship for a marathon. If you complete one mile you earn 1p, if you complete two miles 2p, if you complete three miles 4p and if you complete four miles 8p. This pattern is continued.

a). How much will you earn if you complete 5 miles ?

b). How much will you earn if you complete 10 miles ?

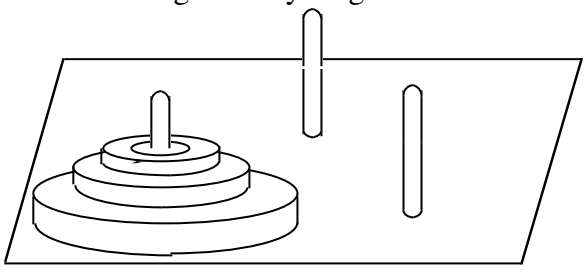
c). How much will you earn if you complete 15 miles ?

d). How much will you earn if you complete 20 miles ?

e). A marathon is 26 miles long (to the nearest mile). How much would you earn for completing the marathon ?

f). Can you find a formula that would work out earnings for any length of race ?

12). The Tower of Bramah. The idea is to move the tower, as it is, from one needle to another needle. You can only move one disc at a time and there must be no smaller discs underneath the disc moved.



a). How many moves will it take to transfer the three discs to recreate the tower ?

b). How many moves will it take to transfer four discs ?

c). How many moves will it take to transfer five discs ?

d). Can you find a pattern between the number of discs and the number of moves ?

Prime Pirate Maze.

The Pirates are on the look out for treasure.
They can only follow a **trail of prime numbers**.
They can only move horizontally or vertically in the maze, **not** diagonally.
Only one pirate that enters the maze will find the treasure.
Beware, there are plenty of wrong trails !!!
Find the lucky pirate and the route he takes.

11	13	43	8	24	3	6	5	79	67	61	59	41	43	19	5	7	2	37	59	71	83	97	9	21
7	49	31	23	19	5	42	19	85	30	12	56	57	85	17	9	33	69	59	14	38	57	89	11	13
3	8	28	7	10	7	17	37	41	2	11	13	43	47	59	1	58	39	13	1	60	75	69	14	7
2	29	17	11	22	81	16	84	9	54	39	97	24	32	11	13	5	7	2	19	83	97	89	57	5
52	37	10	64	15	61	31	7	5	3	17	19	15	7	63	65	49	92	15	41	21	81	29	8	3
1	41	43	47	53	59	63	1	42	22	69	63	34	2	12	50	62	18	42	29	11	26	13	1	19
36	9	66	12	38	21	18	49	68	33	68	20	3	79	47	31	29	11	71	10	97	14	31	53	29
37	89	97	59	41	31	39	67	41	23	19	12	2	10	88	6	4	86	79	84	83	59	37	8	1
60	7	95	66	16	37	20	59	10	76	13	11	41	25	64	2	3	55	83	16	68	21	80	32	11
54	71	81	21	63	23	42	61	55	93	17	16	44	20	78	7	20	81	89	3	13	19	37	4	13
30	67	59	47	2	19	70	97	95	3	5	4	97	7	11	13	93	16	53	82	24	14	57	72	2
6	96	54	49	82	11	6	7	6	2	12	42	31	6	93	84	19	60	41	4	25	7	11	7	5
17	89	23	19	21	7	33	11	57	68	76				74	41	2	57	23	81	90	17	20	93	53
8	81	64	5	3	2	20	13	4	11	31				31	2	55	12	19	10	47	19	84	49	37
19	15	1	37	39	85	74	11	57	7	80				69	3	7	6	5	92	21	13	8	14	59
5	72	49	41	18	49	22	41	98	2	49	98	31	73	10	94	11	25	2	9	49	29	31	37	29
7	84	21	7	46	20	63	59	18	41	43	81	10	67	72	40	29	4	19	20	45	49	32	61	54
59	70	63	83	17	2	29	31	3	49	47	4	50	19	54	43	13	27	23	29	31	15	45	67	1
41	23	7	3	9	25	10	27	17	48	53	88	27	2	65	61	69	22	57	16	59	39	66	59	28
53	10	49	21	31	37	2	39	6	75	59	22	49	13	39	4	76	14	49	18	53	69	14	43	16
29	63	37	29	23	9	3	4	7	97	83	16	78	29	31	11	83	73	71	67	61	8	42	47	70
8	30	18	13	1	15	19	35	14	6	24	4	49	8	14	33	6	18	27	94	15	12	49	67	9
19	17	23	29	12	90	23	29	7	3	2	7	79	23	15	17	19	43	1	3	5	7	89	83	11
59	1	14	57	21	15	37	50	8	32	5	27	16	31	57	13	12	41	86	2	24	35	9	12	2
41	3	5	17	19	23	41	19	97	11	13	73	19	71	9	2	5	37	31	29	17	41	23	7	3

If you get time, colour all the prime numbers in on the maze.
This will show you all the possible pirate trails.

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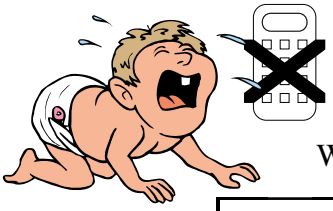
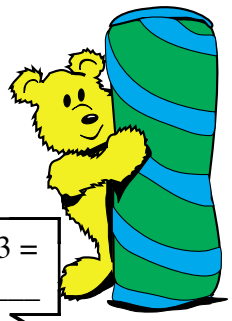


A Prime Maze.

Baba has lost his teddy. He has to get through the maze to find it.
He can only travel along **prime numbers**.
Work out each sum. Now find the route he must take to find his teddy.



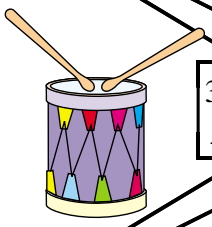
IN

20 - 7 = | 6 x 10 = | 90 - 11 = | 99 ÷ 3 | 39 ÷ 3 =

2 x 17 = | 103 - 44 = | 5 x 9 = | 58 ÷ 2 = | 27 + 34 = | 3 x 31 =

19 + 18 = | 55 ÷ 5 = | 50 - 13 = | 110 ÷ 2 = | 75 - 62 =

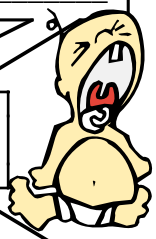
49 + 18 = | 17 x 2 = | 72 ÷ 3 = | 38 + 58 = | 45 - 18 = | 100 ÷ 20 =



36 + 43 = | 6 x 9 = | 85 - 24 = | 18 + 29 = | 92 ÷ 4 =

95 ÷ 5 = | 23 x 3 = | 76 ÷ 38 = | 98 - 74 = | 57 ÷ 57 = | 90 ÷ 6 =

5 x 10 = | 64 - 35 = | 81 - 62 = | 64 - 47 = | 17 + 24 =



105 ÷ 5 = | 91 ÷ 13 = | 150 ÷ 6 = | 24 x 4 = | 15 x 5 = | 105 - 68 =

4 x 22 = | 106 - 65 = | 19 + 64 = | 108 ÷ 12 = | 63 ÷ 9 =

4 x 16 = | 92 ÷ 4 = | 6 x 13 = | 77 ÷ 7 = | 165 ÷ 5 = | 93 - 69 =

9 x 9 = | 79 - 32 = | 9 x 6 = | 25 + 48 = | 39 + 58 =

OUT

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Prime and Square Numbers

Roll the dice. Move forward that many places. If you land on a **prime** number move forwards to the next prime number. If you land on a **square** number move back to the previous square number.

Start	1	2	3	4	5	6	7	8	9	10	11
											12
24	23	22	21	20	19	18	17	16	15	14	13
25											
26	27	28	29	30	31	32	33	34	35	36	37
											38
50	49	48	47	46	45	44	43	42	41	40	39
51											
52	53	54	55	56	57	58	59	60	61	62	63
											64
76	75	74	73	72	71	70	69	68	67	66	65
77											
78	79	80	81	82	83	84	85	86	87	88	89
											90
	WIN	100	99	98	97	96	95	94	93	92	91

Move **forward** to the next **prime number**

Move **back** to the last **square number**

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Multiplying by Powers of 10.

A). Multiply the following by **10**.

1).	5	2).	8	3).	13	4).	21	5).	18
6).	17	7).	38	8).	41	9).	37	10).	89
11).	124	12).	274	13).	579	14).	935	15).	5834
16).	3403	17).	2056	18).	9153	19).	6728	20).	6241
21).	4.6	22).	9.3	23).	16.6	24).	28.2	25).	30.6
26).	0.8	27).	46.9	28).	234.9	29).	0.6	30).	49.3
31).	2.35	32).	7.26	33).	0.42	34).	5.06	35).	9.88
36).	14.56	37).	45.08	38).	50.21	39).	0.89	40).	345.68
41).	5.682	42).	0.083	43).	7.572	44).	9.803	45).	3.719
46).	16.682	47).	25.904	48).	98.455	49).	234.987	50).	382.892

B). Multiply the following by **100**.

1).	7	2).	2	3).	17	4).	29	5).	48
6).	67	7).	48	8).	47	9).	27	10).	99
11).	164	12).	374	13).	679	14).	335	15).	7834
16).	3803	17).	6056	18).	8153	19).	2728	20).	5221
21).	4.54	22).	9.26	23).	16.73	24).	28.18	25).	30.08
26).	0.16	27).	46.82	28).	234.47	29).	0.82	30).	49.62
31).	1.793	32).	3.279	33).	0.479	34).	4.092	35).	1.891
36).	14.312	37).	45.037	38).	50.821	39).	0.512	40).	345.069
41).	4.6	42).	3.8	43).	0.5	44).	7.8	45).	2.7
46).	36.6	47).	15.9	48).	28.4	49).	734.9	50).	882.8

C). Multiply the following by **1000**.

1).	5	2).	1	3).	12	4).	24	5).	78
6).	27	7).	98	8).	46	9).	97	10).	89
11).	124	12).	574	13).	179	14).	235	15).	6824
16).	7803	17).	2057	18).	7153	19).	3728	20).	9201
21).	4.592	22).	9.682	23).	26.054	24).	48.102	25).	10.731
26).	0.931	27).	26.804	28).	434.933	29).	0.951	30).	39.782
31).	1.49	32).	3.27	33).	0.47	34).	7.08	35).	1.89
36).	84.31	37).	25.03	38).	30.82	39).	0.51	40).	545.07
41).	3.7	42).	5.9	43).	0.2	44).	3.8	45).	1.7
46).	26.3	47).	65.1	48).	18.9	49).	234.5	50).	782.9

D). Copy the questions and work out the answer.

1).	5 x 100	2).	7 x 10000	3).	12 x 1000	4).	43 x 10000	5).	68 x 100
6).	76 x 1000	7).	56 x 100	8).	86 x 10	9).	51 x 1000	10).	25 x 10000
11).	262 x 100	12).	541 x 10	13).	948 x 1000	14).	342 x 10	15).	702 x 1000
16).	6503 x 100	17).	7023 x 10	18).	9003 x 100	19).	3401 x 10	20).	3057 x 1000
21).	4.046 x 10	22).	3.642 x100	23).	6.054 x 10	24).	1.102x100	25).	0.7391 x 1000
26).	0.931x100	27).	26.804x10	28).	4.133x100	29).	0.951x100	30).	49.782 x 1000
31).	0.49 x 10	32).	3.27 x 100	33).	0.27 x 100	34).	7.01 x 10	35).	6.959 x 1000
36).	4.31 x 100	37).	25.03 x 10	38).	30.82 x 10	39).	0.51 x 100	40).	345.08 x 1000
41).	3.7 x 1000	42).	5.9 x 100	43).	0.2 x 100	44).	3.8 x 1000	45).	1.7 x 10000
46).	16.3 x 100	47).	55.1 x 10	48).	38.9 x 100	49).	834.5 x 10	50).	582.9 x 10000

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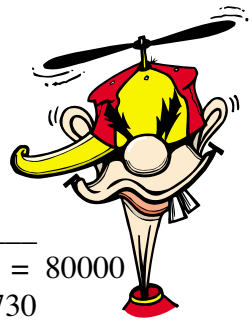

E). Copy the questions and fill in the missing values.

1). 6 x ___ = 60	2). ___ x 100 = 500	3). 9 x 1000 = ___
4). ___ x 10 = 70	5). 3 x ___ = 3000	6). ___ x 10000 = 80000
7). 16 x 1000 = ___	8). ___ x 100 = 5000	9). 73 x ___ = 730
10). ___ x 100 = 5600	11). 68 x 1000 = ___	12). ___ x 1000 = 93000
13). 4.7 x 10000 = ___	14). ___ x 10 = 67	15). 9.7 x ___ = 97000
16). 0.8 x ___ = 800	17). 1.7 x 1000 = ___	18). 6.3 x ___ = 63
19). 31.3 x ___ = 3130	20). ___ x 100 = 1230	21). ___ x 1000 = 89300
22). 47.5 x ___ = 475	23). 0.5 x ___ = 5000	24). 2.1 x 100 = ___
25). 3.42 x 1000 = ___	26). 5.62 x ___ = 562	27). 9.03 x ___ = 9030
28). ___ x 100 = 341	29). ___ x 10 = 3.4	30). 6.01 x 1000 = ___
31). 0.67 x ___ = 6700	32). ___ x 10 = 6	33). ___ x 1000 = 70
34). 0.03 x 10000 = ___	35). 5.08 x 1000 = ___	36). ___ x 100 = 8
37). ___ x 10 = 54.36	38). 7.009 x 100 = ___	39). ___ x 10000 = 134.56
40). 0.004 x ___ = 0.4	41). 6.781 x ___ = 6781	42). ___ x 10 = 0.37
43). ___ x 100 = 7.4	44). 0.001 x ___ = 0.01	45). 3.008 x 1000 = ___

F). Copy the questions and work out the answer.

1). 4×10^2	2). 3×10^1	3). 11×10^3	4). 23×10^4	5). 18×10^3
6). 86×10^4	7). 26×10^2	8). 16×10^1	9). 91×10^3	10). 35×10^1
11). 242×10^1	12). 501×10^3	13). 148×10^2	14). 442×10^1	15). 202×10^3
16). 1503×10^1	17). 8023×10^3	18). 1003×10^4	19). 6405×10^2	20). 1059×10^1
21). 3.086×10^2	22). 1.642×10^3	23). 2.074×10^1	24). 1.002×10^4	25). 0.031×10^1
26). 0.301×10^3	27). 16.104×10^2	28). 3.138×10^3	29). 0.251×10^1	30). 89.182×10^2
31). 0.19×10^2	32). 8.67×10^1	33). 5.27×10^3	34). 0.05×10^1	35). 4.89×10^2
36). 8.32×10^4	37). 75.83×10^1	38). 40.74×10^3	39). 0.51×10^3	40). 375.08×10^2
41). 8.7×10^1	42). 2.9×10^3	43). 5.2×10^4	44). 0.8×10^4	45). 3.7×10^2
46). 73.3×10^2	47). 47.1×10^4	48). 74.9×10^1	49). 835.5×10^1	50). 372.9×10^4

G). Copy the questions and fill in the missing values.

1). ___ x 10^2 = 800	2). ___ x 10^1 = 700	3). 3 x 10^2 = ___
4). ___ x 10^4 = 20000	5). 8 x ___ = 8000	6). ___ x 10^3 = 9000
7). 36 x 10^3 = ___	8). ___ x 10^2 = 7000	9). 23 x ___ = 230
10). ___ x 10^1 = 5600	11). 68 x 10^1 = ___	12). ___ x 10^3 = 93000
13). 4.7 x 10^2 = ___	14). ___ x 10^1 = 47	15). 1.7 x ___ = 170
16). 0.4 x ___ = 4000	17). 1.7 x 10^2 = ___	18). 8.3 x ___ = 83
19). 21.3 x ___ = 2130	20). ___ x 10^1 = 13	21). ___ x 10^3 = 19300
22). 42.5 x ___ = 425	23). 0.1 x ___ = 10	24). 7.1 x 10^2 = ___
25). 3.02 x 10^3 = ___	26). 2.62 x ___ = 262	27). 3.03 x ___ = 3030
28). ___ x 10^2 = 541	29). ___ x 10^2 = 8	30). 9.02 x 10^2 = ___
31). 0.34 x ___ = 340	32). ___ x 10^1 = 2	33). ___ x 10^4 = 700
34). 0.07 x 10^4 = ___	35). 2.03 x 10^3 = ___	36). ___ x 10^1 = 0.8
37). ___ x 10^1 = 14.36	38). 7.009 x 10^3 = ___	39). ___ x 10^1 = 134.56
40). 0.005 x ___ = 50	41). 1.781 x ___ = 1781	42). ___ x 10^2 = 0.3
43). ___ x 10^2 = 7.4	44). 0.004 x ___ = 0.04	45). 8.002 x 10^3 = ___

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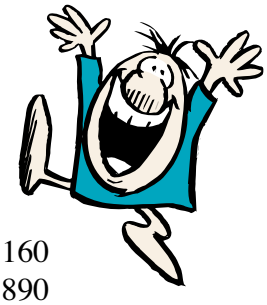
Dividing by Powers of 10.



A). Divide the following by **10**.

1).	70	2).	40	3).	90	4).	120	5).	160
6).	320	7).	390	8).	420	9).	370	10).	890
11).	1240	12).	2340	13).	5580	14).	9290	15).	5700
16).	34430	17).	20050	18).	34830	19).	67800	20).	62000
21).	49	22).	92	23).	12	24).	28	25).	39
26).	73	27).	98	28).	7	29).	63	30).	3
31).	13.7	32).	45.9	33).	98.2	34).	40.1	35).	75.6
36).	135.3	37).	232.6	38).	634.1	39).	6.2	40).	3.74
41).	0.59	42).	10.03	43).	57.72	44).	89.03	45).	56.79
46).	316.682	47).	525.904	48).	198.455	49).	234.987	50).	382.892

B). Divide the following by **100**.

1).	800	2).	200	3).	1700	4).	2900	5).	4800
6).	6700	7).	4800	8).	4700	9).	2700	10).	9900
11).	1640	12).	3740	13).	6790	14).	3350	15).	7830
16).	3880	17).	6050	18).	8150	19).	2720	20).	5220
21).	454	22).	926	23).	1673	24).	2818	25).	3008
26).	16	27).	4682	28).	2347	29).	82	30).	4
31).	31.7	32).	23.2	33).	56.7	34).	14.2	35).	81.1
36).	4.12	37).	0.07	38).	8.81	39).	324.5	40).	945.9
41).	4.6	42).	453.8	43).	0.4	44).	7.8	45).	9.7
46).	436.6	47).	1.879	48).	428.4	49).	73.39	50).	0.002

C). Divide the following by **1000**.

1).	5000	2).	1000	3).	42000	4).	74000	5).	38000
6).	17000	7).	54000	8).	7000	9).	29000	10).	89000
11).	1600	12).	7200	13).	27900	14).	22900	15).	60700
16).	200	17).	8500	18).	16700	19).	3700	20).	600
21).	4592	22).	9682	23).	2754	24).	4102	25).	1731
26).	931	27).	804	28).	933	29).	951	30).	782
31).	568.7	32).	6794.2	33).	9803.6	34).	957.2	35).	2003.5
36).	84.1	37).	25.3	38).	30.2	39).	9.5	40).	545.7
41).	3.74	42).	5.95	43).	57.24	44).	3891.86	45).	1.79
46).	2646.31	47).	605.12	48).	18.08	49).	4.57	50).	71282.93

D). Copy the questions and work out the answer.

1).	500 ÷100	2).	70 ÷ 10	3).	9000 ÷100	4).	4300 ÷ 10	5).	6000 ÷ 1000
6).	76 ÷ 10	7).	560 ÷ 100	8).	860 ÷ 100	9).	51 ÷ 10	10).	5700 ÷ 1000
11).	8 ÷ 10	12).	46 ÷ 100	13).	580 ÷ 1000	14).	34 ÷ 100	15).	720 ÷ 1000
16).	653 ÷ 100	17).	7023 ÷ 10	18).	903 ÷ 100	19).	3401 ÷ 100	20).	57 ÷ 1000
21).	4.6 ÷ 10	22).	3.2 ÷100	23).	6.4 ÷ 1000	24).	1.2 ÷100	25).	0.7 ÷ 10
26).	0.91 ÷10	27).	6.88 ÷100	28).	4.03 ÷1000	29).	0.71 ÷10	30).	49.78 ÷ 1000
31).	8.9 ÷ 10	32).	327 ÷ 100	33).	27 ÷ 1000	34).	7.01 ÷ 100	35).	6.99 ÷ 10
36).	31 ÷ 100	37).	2503 ÷ 10	38).	30.82 ÷ 10	39).	0.51 ÷ 100	40).	345.08 ÷ 1000
41).	9.7 ÷ 1000	42).	59 ÷ 1000	43).	0.2 ÷ 100	44).	3.8 ÷ 10	45).	1.7 ÷ 1000
46).	26.3 ÷ 100	47).	55.1 ÷ 10	48).	38.9 ÷ 100	49).	834.5 ÷ 10	50).	2.09 ÷ 1000

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E). Copy the questions and fill in the missing values.

1). 60 ÷ ___ = 6	2). ___ ÷ 100 = 5	3). 9000 ÷ 1000 = ___
4). ___ ÷ 10 = 70	5). 3000 ÷ ___ = 30	6). ___ ÷ 100 = 80
7). 1600 ÷ 1000 = ___	8). ___ ÷ 100 = 5.6	9). 7300 ÷ ___ = 730
10). ___ ÷ 100 = 720	11). 680 ÷ 1000 = ___	12). ___ ÷ 1000 = 9.3
13). 47 ÷ 100 = ___	14). ___ ÷ 10 = 0.6	15). 970 ÷ ___ = 9.7
16). 800 ÷ ___ = 0.8	17). 170 ÷ 1000 = ___	18). 6.3 ÷ ___ = 0.63
19). 313 ÷ ___ = 3.13	20). ___ ÷ 100 = 12.3	21). ___ ÷ 1000 = 89.3
22). 475 ÷ ___ = 47.5	23). 50 ÷ ___ = 0.5	24). 21 ÷ 100 = ___
25). 34.2 ÷ 1000 = ___	26). 562 ÷ ___ = 56.2	27). 903 ÷ ___ = 9.03
28). ___ ÷ 100 = 34.1	29). ___ ÷ 10 = 3.4	30). 601 ÷ 100 = ___
31). 67 ÷ ___ = 0.67	32). ___ ÷ 10 = 6	33). ___ ÷ 1000 = 70
34). 0.3 ÷ 10 = ___	35). 58 ÷ 1000 = ___	36). ___ ÷ 100 = 0.07
37). ___ ÷ 10 = 54.36	38). 7009 ÷ 100 = ___	39). ___ ÷ 10 = 134.56
40). 0.4 ÷ ___ = 0.004	41). 6781 ÷ ___ = 6.781	42). ___ ÷ 10 = 0.37
43). ___ ÷ 100 = 7.4	44). 0.01 ÷ ___ = 0.001	45). 30.08 ÷ 1000 = ___

F). Copy the questions and work out the answer.

1). $478 \div 10^2$	2). $96 \div 10^1$	3). $1200 \div 10^3$	4). $2300 \div 10^4$	5). $1800 \div 10^3$
6). $8670 \div 10^4$	7). $78 \div 10^2$	8). $76 \div 10^1$	9). $591 \div 10^3$	10). $385 \div 10^1$
11). $242 \div 10^1$	12). $501 \div 10^3$	13). $148 \div 10^2$	14). $442 \div 10^1$	15). $202 \div 10^3$
16). $1.3 \div 10^1$	17). $803 \div 10^3$	18). $1003 \div 10^4$	19). $605 \div 10^2$	20). $1059 \div 10^1$
21). $38.6 \div 10^2$	22). $164.2 \div 10^3$	23). $27.4 \div 10^1$	24). $100.2 \div 10^4$	25). $0.031 \div 10^1$
26). $0.301 \div 10^2$	27). $16.14 \div 10^2$	28). $3.138 \div 10^3$	29). $0.251 \div 10^1$	30). $89.182 \div 10^2$
31). $7.19 \div 10^2$	32). $8.67 \div 10^1$	33). $5.27 \div 10^3$	34). $0.05 \div 10^1$	35). $4.89 \div 10^2$
36). $882 \div 10^4$	37). $75.83 \div 10^1$	38). $4074 \div 10^3$	39). $51 \div 10^3$	40). $37508 \div 10^2$
41). $8.7 \div 10^1$	42). $2.9 \div 10^3$	43). $5.2 \div 10^4$	44). $0.8 \div 10^4$	45). $3.7 \div 10^2$
46). $73.3 \div 10^2$	47). $4710 \div 10^4$	48). $749 \div 10^1$	49). $835 \div 10^1$	50). $302.9 \div 10^4$

G). Copy the questions and fill in the missing values.

1). ___ ÷ 10^2 = 4	2). ___ ÷ 10^1 = 50	3). 300 ÷ 10^2 = ___
4). ___ ÷ 10^4 = 3	5). 700 ÷ ___ = 7	6). ___ ÷ 10^3 = 12
7). 360 ÷ 10^3 = ___	8). ___ ÷ 10^2 = 7.2	9). 290 ÷ ___ = 2.9
10). ___ ÷ 10^1 = 5.7	11). 68 ÷ 10^1 = ___	12). ___ ÷ 10^3 = 9.8
13). 47 ÷ 10^2 = ___	14). ___ ÷ 10^1 = 47	15). 17 ÷ ___ = 0.017
16). 4000 ÷ ___ = 0.4	17). 19 ÷ 10^2 = ___	18). 83 ÷ ___ = 8.3
19). 2180 ÷ ___ = 2.18	20). ___ ÷ 10^1 = 13	21). ___ ÷ 10^3 = 19
22). 425 ÷ ___ = 42.5	23). 100 ÷ ___ = 0.1	24). 0.6 ÷ 10^1 = ___
25). 3.02 ÷ 10^3 = ___	26). 2.62 ÷ ___ = 0.262	27). 303 ÷ ___ = 0.0303
28). ___ ÷ 10^2 = 5.41	29). ___ ÷ 10^2 = 0.006	30). 9.02 ÷ 10^2 = ___
31). 4 ÷ ___ = 0.004	32). ___ ÷ 10^1 = 2	33). ___ ÷ 10^4 = 3
34). 0.7 ÷ 10^2 = ___	35). 203 ÷ 10^3 = ___	36). ___ ÷ 10^1 = 0.008
37). ___ ÷ 10^1 = 14.36	38). 7.009 ÷ 10^3 = ___	39). ___ ÷ 10^1 = 134.56
40). 0.05 ÷ ___ = 0.0005	41). 1.71 ÷ ___ = 0.171	42). ___ ÷ 10^2 = 0.3
43). ___ ÷ 10^2 = 7.4	44). 0.4 ÷ ___ = 0.00004	45). 68.002 ÷ 10^3 = ___

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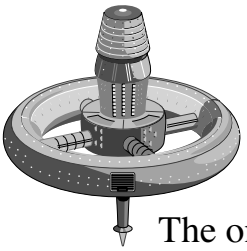
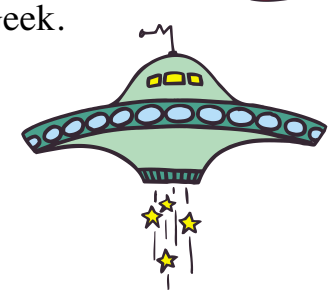


Zap to Zero.

The aliens are coming to town.
The only way to annihilate them is to **zap them to zero**.
Captain Slog keeps careful records of every alien's number he zaps.
He is very orderly about it. He always zaps the smallest digit first
in the alien's number. He then works his way up to the biggest digit.
His last encounter was with the alien formerly known as 4792.316,
a cheeky green chappie from the planet Geek.



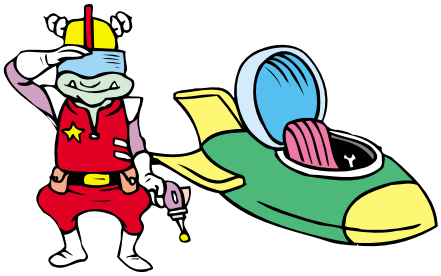
Here is Captain Slog's Log.

Keys Used	Calculator Display
Start	4792.316
x 100	479231.6
- 1	479230.6
÷ 100	4792.306
- 2	4790.306
x 10	47903.06
- 3	47900.06
÷ 10000	4.790006
- 4	0.790006
x 1000000	790006
- 6	790000
÷ 100000	7.9
- 7	0.9
x 10	9
- 9	0

Aliens Trashed !

Here are the Captain's Rules of Encounter.

1). Enter the alien's number into your calculator.
2). You zap an alien by turning it into zeros.
3). You can only zap an alien in the units column by subtracting.
4). The alien's number has to be zapped from smallest to biggest digit.
5). You can multiply or divide by 10, 100, 1000, ...
6). All zapping must be recorded in Captain Slog's Log.
7). **Only the brave survive**.



Oh dear those naugthy Geeks are attacking Earth's defences again.
Captain Slog is on holiday.
Only you can help.

Be ruthless.

Here are the names of the "alien eight".

1).	374.18	2).	6513.4	3).	714.59	4).	1732.64
5).	739.216	6).	2513.96	7).	1578.324	8).	631.9427

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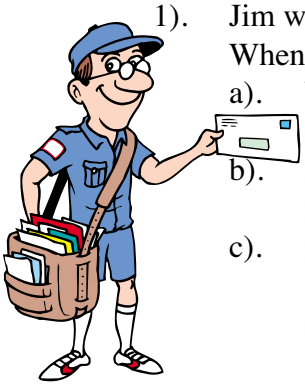
Stamps.



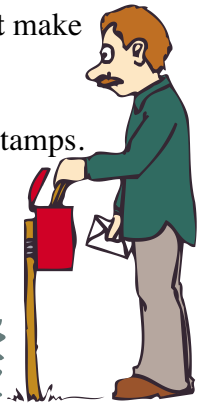
1). Jim works in a small village Post Office and it has run out of stamps.
When the new stamps arrive there are only 4p and 7p stamps.

a). Which stamps does he need to put on a letter that needs the value
i). 20 p, ii). 24p, ii). 25p, iv). 33p ?

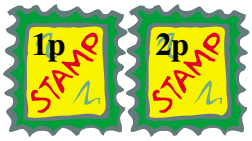
b). i). Which values **can't** he make ?
ii). What is the largest value he can't make ?

c). i). Investigate other **pairs** of stamps. For these pairs look for the largest values he **can't** make?
ii). Try to find a general formula for the largest value a pair of stamps x and y **can't** make.

d). Hence, or otherwise, find the largest value the following pairs of stamps **can't** make
i). 5p and 8p, ii). 11p and 12p, iii). 22p and 25p.

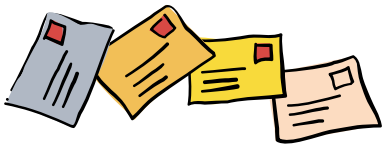


2). Jim rings up head office for more stamps. This time they only send him 1p and 2p stamps.
He looks at all the ways he can make the value 3p.
He finds 3 ways.
(Notice the order of the stamps is important. 1p, 2p is different from 2p, 1p).



a). How many ways can he make the value of 4p ?
b). Investigate how many ways he can make other values.
c). This pattern has name. What is it ?

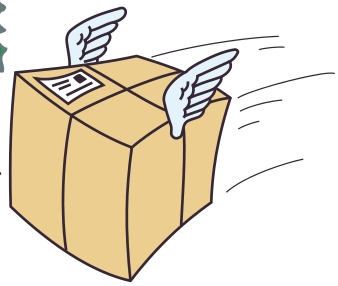
3). When the Post office is shut the stamps can be bought from a machine outside.
The machine dispenses books with 5 stamps in it.
The books have to make up **all consecutive** values without any gaps.
For example, this book of 5 stamps could make up the values:
1p, 2p, 3p, 4p, 5p, 6p and 7p. 7 consecutive values in total.



Investigate the values other books of 5 stamps can make.
What are the values of the 5 stamps that make the **most** number of consecutive values ?

4). A new book of 7 stamps is introduced.

This book has stamps of value 1p, 2p, 5p, 10p, 20p, 50p and £1.
Investigate the different values that can be made from this book.



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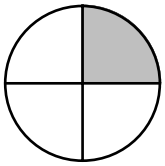
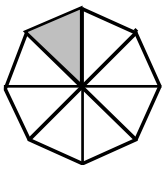
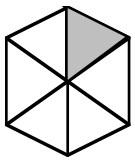
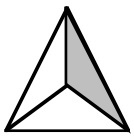
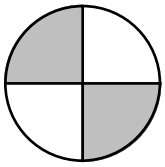
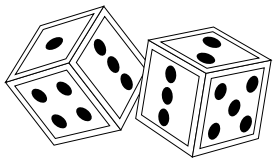
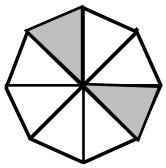
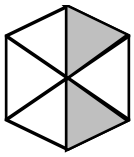
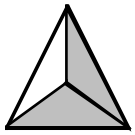
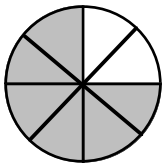
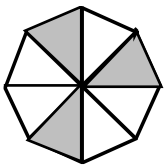
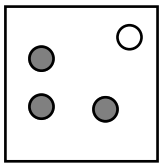
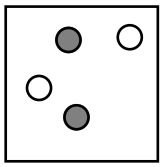
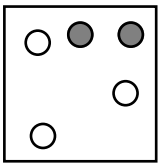
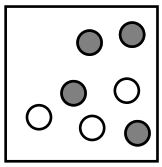
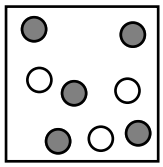
Probability (Equally Likely Outcomes).

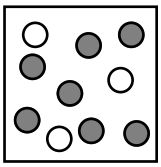
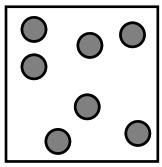
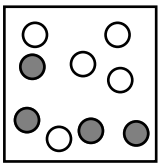
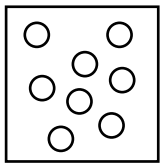
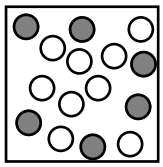
1). The following fair spinners are spun. What is the probability of landing on the shaded section for each spinner ?

a). 
b). 
c). 
d). 
e). 

f). 

g). 
h). 
i). 
j). 

2). Counters are placed in a box. For each of the following boxes, find the probability of a shaded counter being drawn out of the box at random.

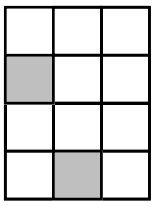
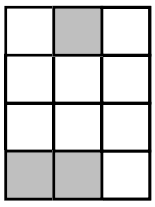
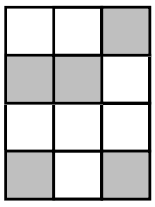
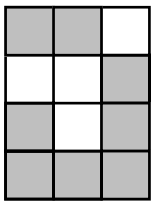
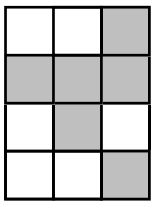
a). 
b). 
c). 
d). 
e). 

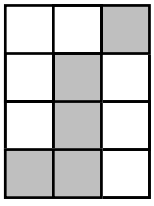
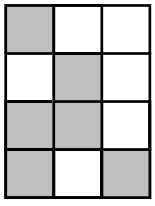
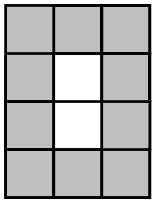
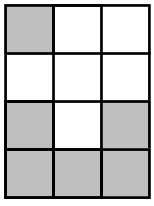
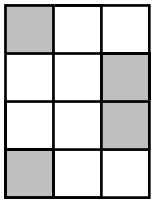
f). 
g). 
h). 
i). 
j). 

3). If a fair six-sided dice is thrown, what is the probability that the score is :-

a). a 5 (five) b). an even number c). an odd number
d). a prime number e). a square number f). greater than 4 ?

4). In a game you throw a coin onto a board. It will always land exactly on one square. If you land on a shaded square you win. Find the probability of winning on the following boards.

a). 
b). 
c). 
d). 
e). 

f). 
g). 
h). 
i). 
j). 

k). Which of these boards are "fair" ?
l). Which board would you like to play on, because you would be most likely to win ?
m). Which board would you **not** like to play on, because you would be most likely to lose?

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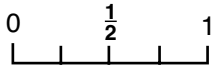
5). Ten counters are placed in a box. The counters are labelled A, B, C, D, E, F ,G, H, I and J. If one counter is drawn at random from the box find the probability that it is :-

a). a vowel b). a consonant c). a D ?

6). 

Draw the number line in your book. The number line represents all possible probabilities. Indicate, using arrows labelled "a" to "f" the probabilities for :-

a). throwing a HEAD on a coin; b). cutting a spade from a pack of cards;
c). May following April; d). the electricity being cut off today;
e). scoring a 1 or a 6 on a dice; f). scoring 23 with one dart on a dartboard.

7). There are 12 counters in a box. The counters are numbered 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12. If one counter is drawn out at random, what is the probability that it is a counter :-

a). with an odd number b). with an even number
c). with a square number d). that is greater than or equal to 8 ?

8). I have a pack of playing cards, containing 52 cards. I pick a card at random. What is the probability that the card I select is :-

a). a king b). an ace c). a diamond
d). a red card e). a 10 (ten) f). the queen of Spades ?

9). Writing pads are available in 4 different colours. In a pack there are 6 blue, 8 red, 14 white and 18 green. What is the probability when I open a new pack I randomly pick a :-

a). blue pad b). red pad c). white pad
d). green pad e). yellow pad f). red or white pad ?

10). A bag contains 6 blue discs, 10 orange discs and 4 red discs. If a disc is picked at random what is the probability of getting :-

a). a blue disc b). an orange disc c). a blue or red disc
d). a blue or orange disc e). **not** an orange disc f). a blue, orange or red disc?

11). A small box of chocolates contains 6 hard centres, 8 soft centres and 12 chewy centres. What is the probability of picking :-

a). a hard centre b). a hard or soft centre c). a soft or chewy centre
d). a hard or chewy centre e). **not** a soft centre f). **not** a soft or hard centre ?

12). In a class of thirty pupils 8 play hockey, 10 play football, 4 play rugby and 8 go swimming. If a pupil is selected at random, what is the probability that the pupil will

a). play football b). play hockey or swim c). play hockey or football
d). **not** play rugby e). **not** swim f). **not** play rugby or swim ?

13). In a 50 pence cash bag there are ten 1 pence coins, five 2 pence coins, four 5 pence coins and one 10 pence coin. If a coin is drawn at random, what is the probability that the coin :-

a). is a 5p b). is a copper coin c). is **not** a 5p or 10p
d). is a 1p or a 5p e). is **not** a copper coin f). is **not** a 1p, 2p or 5p ?

14). A box contains 2 blue discs, 14 green discs and 4 red discs. If a disc is picked at random what is the probability of getting :-

a). a blue disc b). a green disc c). a blue or red disc
d). a blue or green disc e). **not** a green disc f). a blue, green or red disc?

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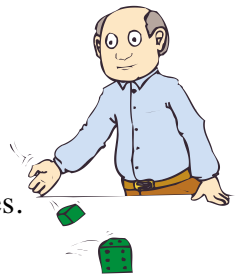
Assigning Probabilities.



We cannot always assign a probability to an event using equally likely outcomes.
Another way to assign a probability is to do an experiment or survey.
When we conduct our experiment or survey the bigger the sample the more accurate the results!

Surveys.

1). In this survey we will find the probability that the next car passing the school is red.
   a). Copy and complete the table below.

Car Colour	Tally	Freq.
Red Not Red	Lots of space will be needed for Not Red!	
	Total	

   b). P (next car is red) = $\frac{\text{Number of red cars}}{\text{Total of cars in survey}}$ = ___ (Cancel this down if you can).

Conduct a survey that will find the following probabilities :-

2). that the next vehicle passing the school is a bus.
3). that the next person I meet in school likes netball as their favourite sport.
4). that the next person I meet in school has school dinners.

Experiments.

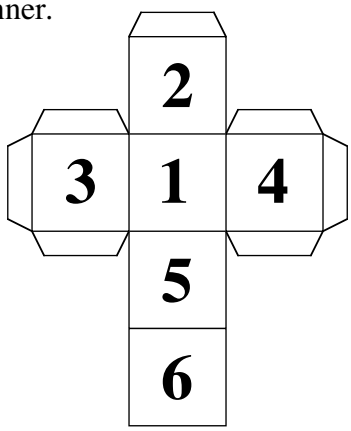
1). In this experiment we will find the probability of a drawing pin landing point down when dropped on to the table 150 times.
   a). Copy and complete the table below.

Outcome	Tally	Freq.
Point down Point up		
	Total	

   b). P (Point down) = $\frac{\text{Number of Point down}}{\text{Total number of drops}}$ = ___ (Cancel this down if you can).

2). Cut out your own spinner from cardboard. **Do not make a regular shape**. Mark off sectors and label them with numbers. Push a matchstick through the centre. Secure this with blu-tac if it is wobbly! You now have your own unique spinner.
Find the probabilities of it landing on each sector for 200 spins.

3). Make your own biased die. Copy the net on to squared paper. Cut it out. Now add a small piece of blu-tac to one of the sides. Make sure this is firmly attached and will not fall off. This will weigh the die down to one side and make it biased.
Now make the die.
Roll it 200 times and find the probabilities of it landing on each side.



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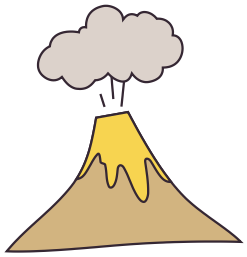
Look Back at Data.

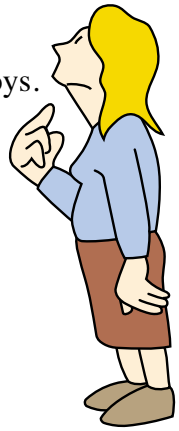
Sometimes we cannot do a survey or experiment because the events happen infrequently.
For example you would not sit watching a volcano to see if it erupted. You would look back at data in newspapers and journals.



A -- Use equally likely outcomes.
B -- Look back at data.
C -- Use a survey or experiment to collect data.

Which of the above methods would you use to find :-

1). The probability a particular country will have an earthquake next year.
2). The probability a person chosen at random in a sports club will be left handed.
3). The probability a **biased die** will land on 6 when rolled.
4). The probability a girl's name will be picked at random out of 50 girls and 50 boys.
5). The probability that a car is broken into on a Saturday night in London.
6). The probability a shoe pushed off a desk will land the right way up.
7). The probability a **fair die** will land on 6 when rolled.
8). The probability that I win a raffle if I buy 10 out of the 150 tickets on sale.
9). The probability that it will snow on Christmas day.
10). The probability that a diamond will be chosen from a pack of cards.



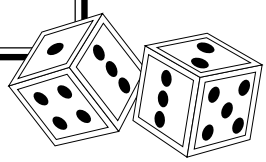
Theory v Experiment.

In this section we will compare probability theory with our experiments.
Where the answer is a probability, leave it as a decimal - it will be easier to compare results.

1). Throwing a coin.
   a). What is the probability theory of throwing a coin and it landing on Heads ?
   b). If I throw the coin 200 times how many times would I expect it to land on Heads ?
   c). Now throw a coin 200 times and record your results.
   d). Are the results exactly as the theory said ?
   What experimental probability did you get for landing on Heads ?
   e). Put your class results together. What experimental probability did the class get as a whole ? Was this better than yours on its own ?

2). Rolling a die.
   a). What is the probability theory of rolling a die and it landing on number 2 ?
   b). If I roll the die 120 times how many times would you expect it to land on number 2 ?
   c). Now roll the die 120 times and record your results.
   d). Are the results exactly as the theory said ?
   What experimental probability did you get for landing on 2 ?
   e). Put your class results together. What experimental probability did the class get as a whole ? Was this better than yours on its own ?

The more times you do an experiment the closer the results get to the theoretical probability.



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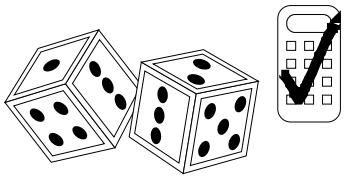
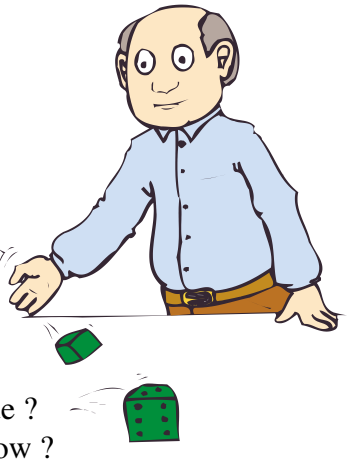


Experimental Probabilities.



1). Here are the results of a survey of cars passing the school.

Colour	Red	Blue	Green	Yellow	Other
Number of cars	40	30	15	10	5

a). What is the probability of the next car passing the school being:-
i). red; ii). green; iii). yellow; iv). **not** blue ?
b). If 900 cars pass the school, how many do you think would be yellow ?
c). If 60 cars pass the school, how many do you think would be red ?
d). If 400 cars pass the school, how many do you think would be blue ?

2). A drawing pin is repeatedly dropped in an experiment to see which way up it will land. Here are the results.

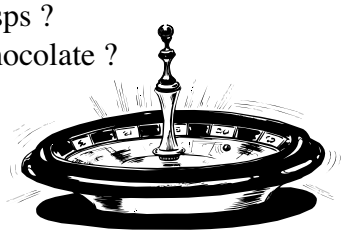
Outcome	Frequency
Point up	160
Point down	40

a). What is the probability of the drawing pin landing
i). point up; ii). point down ?
b). If the drawing pin is dropped 600 times how many times do you think it would land point up ?
c). If the drawing pin is dropped 50 times how many times do you think it would land point down ?

3). Jean conducts a survey on pupils' favourite snacks. Here are the results:-

Snack	Crisps	Chocolate	Fruit	Biscuit	Other
Frequency	30	25	8	40	17

a). What is the probability of a pupil:-
i). liking Crisps; ii). liking Fruit; iii). liking Biscuits; iv). **not** liking chocolate?
b). If 600 pupils were asked, how many would say they preferred a biscuit ?
c). If 80 pupils were asked, how many would say they preferred crisps ?
d). If 360 pupils were asked, how many would say they preferred chocolate ?



4). In an experiment, 20 seeds are sown, but only 14 germinate.
a). What is the experimental probability of a seed:-
i). germinating; ii). not germinating ?
b). If 60 seeds are sown, what number might be expected to germinate ?

5). 50 trains arrived at Bolton Station this morning. 12 arrived early, 8 were late and the rest were on time.
a). What is the probability that the next train will be:-
i). late; ii). early; iii). on time ?
b). 15 trains arrive in the afternoon, how many would you expect on time ?
c). Tomorrow 75 trains are due, how many would you expect to be early ?
d). This week 825 trains should come through Bolton Station, how many would you expect to be late ?

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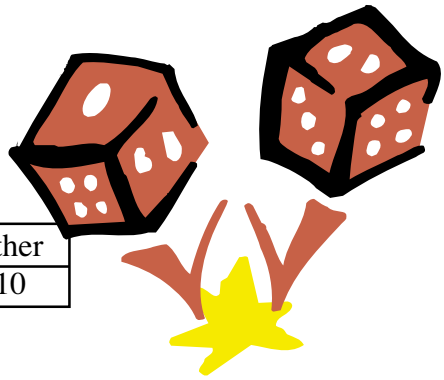


6). Here are the results of a survey of favourite colours in Year 7.

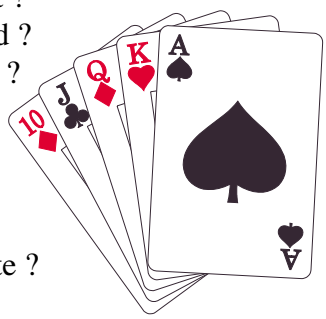
Colour	Red	Blue	Green	Yellow	Other
Frequency	80	26	34	30	10

a). What is the probability that a pupil's favourite colour is:
i). red; ii). green; iii). yellow; iv). **not** blue ?
b). If 720 pupils are asked, how many do you think would say red ?
c). If 24 pupils are asked, how many do you think would say yellow ?
d). If 90 pupils are asked, how many do you think would say blue ?

7). Andrew and Gordon conduct a survey on pupils' favourite pets. Here are the results:-

Pet	Cat	Chimp	Dog	Bird	Other
Frequency	16	4	24	3	1

a). What is the probability of a pupil's favourite pet being:-
i). a cat; ii). a chimp; iii). a bird; iv). **not** a dog?
b). If 270 pupils were asked, how many would say they preferred a cat ?
c). If 464 pupils were asked how many would say they preferred a bird ?
d). If 38 pupils were asked, how many would say they preferred a dog ?



8). In an experiment, 92 seeds are sown, but only 69 germinate.
a). What is the experimental probability of a seed :-
i). germinating; ii). not germinating ?
b). If 552 seeds are sown, what number might be expected to germinate ?

9). A Police car stops 100 cars at random. 8 drivers had not paid their road tax, 3 others had no insurance and 4 others had invalid MOT certificates. The rest of the cars had everything in order.
a). What is the probability of a driver's documents being in order ?
b). The next day the police car stops 300 cars, how many might they expect to have no insurance ?

10). 60 buses arrived at Bury Terminal this morning. 15 arrived early, 10 were late and the rest were on time.
a). What is the probability that the next bus will be:-
i). late; ii). early; iii). on time ?
b). 48 buses arrive in the afternoon, how many would you expect on time ?
c). Tomorrow 108 buses are due, how many would you expect to be early ?
d). This week 696 buses should come through Bury Terminal. How many would you expect to be late ?

11). On average, 3 out of 100 households have no television, 21 have a black and white set, and the rest have a colour television set. If a school has 800 families, find:-
a). the probability of a pupil having a colour television set at home,
b). how many of the families might have a colour television set,
c). how many of the families might have no television set at all.

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