

SETTLERSFor a Word version, click [here](#)

Settlers are short problems that can be used to get a class to start thinking and to get ready for the lesson.

One way to use them is to have a problem on the board when the students enter the room. Having a small reward (e.g. an individually wrapped chocolate like a fantale) for the first student to have the correct answer written in their work book in the appropriate place can encourage students to sit down and get their book open quickly.

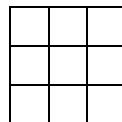
The reward can be given quietly so that other students continue to work on the problem for a while. Once they have had enough time, the teacher can explain the problem and/or get the winning student to explain. [Solutions and brief explanations are given with each problem.]

Some of the problems are in short sequences of similar problems that can be given one per lesson over a few lessons. In these sequences, the early ones can be solved by brute force, though later ones become time-consuming unless students find a short-cut. Students who explain how they got the answer will often use the short cut and other students can pick this up and use it for the next one.

If you suspect that a student has found these problems on the Internet, you might need to use them in a different order and/or change the numbers slightly.

You will probably want to let the students use calculators. Apart from anything else, if you don't, some might cheat by using them under the desk anyway.

1. How many squares here (of all sizes)?
(14: 9 small, 4 medium and 1 large)



2. Ditto with a 4×4 square. (30: 16 small, 9 2×2 , 4 3×3 , 1 large)
3. Ditto with a 5×5 square. (55: $25+16+9+4+1$)
4. Ditto with a 6×6 square. (91: $36+25+16+9+4+1$)
5. How many squares on a chess board? (204: $64+49+36+25+16+9+4+1$)

6. A stack of oranges is in the shape of a square pyramid with 1 orange in the top layer, 4 in the next, 9 in the next and so on. If there are 8 layers, how many oranges? (204: $1+4+9+16+25+36+64$)
7. A stack of oranges is in the shape of a square pyramid with 1 orange in the top layer, 4 in the next, 9 in the next and so on. If there are 10 layers, how many oranges? (385: $1+4+9+16+25+36+64+81+100$)
8. What is the 20th number in this pattern: 11, 13, 15, 17, 19, ... (49: $11+19\times 2$)
9. What is the 50th number in this pattern: 8, 13, 18, 23, 28, ... (253: $8+49\times 5$)
10. What is the 100th number in this pattern: 12, 15, 18, 21, 24, ... (309: $12+99\times 3$)
11. What is the 1000th number in this pattern: 29, 36, 43, 50, 57, ... (7022: $29+999\times 7$)
12. A rectangle is twice as long as it is wide. If its perimeter is 42 cm, what is its area? (98 cm²: 14×7)
13. A rectangle is three times as long as it is wide. If its perimeter is 64 cm, what is its area? (192 cm²: 24×8)
14. A rectangle is five times as long as it is wide. If its area is 80 cm², what is its perimeter? (48 cm: 20×4)
15. A rectangle is $2\frac{1}{2}$ times as long as it is wide. If its area is 90 cm², what is its area? (42 cm: 15×6)
16. What is the mean of the ten factors of 48? (12.4: $(1+2+3+4+6+8+12+16+24+48)\div 10$)
17. What is the mean of the factors of 60? (14: $(1+2+3+4+5+6+10+12+15+20+30+60)\div 12$)
18. What is the median of the factors of 36? (6: 1 2 3 4 **6** 9 12 18 36)
19. What is the median of the factors of 60? (8: 1 2 3 4 5 6 **med** 10 12 15 20 30 60)
20. What is the median of the factors of 144? (12: 1 2 3 4 6 8 9 **12** 16 18 24 36 48 72 144)
21. What is the median of the factors of 42^2 ? (42: the median of the factors of x^2 is always x)
22. Which of the following have odd numbers of factors: 1, 6, 16, 24, 30? (1, 16: the square numbers)
23. Which of the following have odd numbers of factors: 2, 4, 6, 12, 36? (4, 36)
24. Which of the following have odd numbers of factors: 1, 7, 15, 25, 100? (1, 25, 100)

25. Which of the following have odd numbers of factors: 4, 9, 15, 25, 64, 90?
(4, 9, 25, 64)
26. $\frac{1}{2}$ of a number is 12 more than $\frac{1}{4}$ of the same number. What is the number?
(48: $\frac{1}{4}$ of the number is 12)
27. $\frac{3}{4}$ of a number is 16 more than $\frac{1}{4}$ of the same number. What is the number?
(32: $\frac{1}{2}$ the number is 16)
28. $\frac{7}{10}$ of a number is 36 more than $\frac{3}{10}$ of the same number. What is the number?
(90: $\frac{4}{10}$ is 36, $\frac{1}{10}$ is 9, $\frac{10}{10}$ is 90)
29. 55% of a number is 13 more than 30% of the same number. What is the number?
(52: 25% is 13, 100% is 52)
30. What time is it 150 hours after 10:30 am? (4:30 p.m.: $6 \times 24\text{h} + 6\text{h}$)
31. What time is it 2401 hours after 4:30 pm? (5:30 p.m.: $100 \times 24\text{h} + 1\text{h}$)
32. What day of the week is it 7775 days after Tuesday?
(Sunday: 1110 weeks + 5 days)
33. What is the date 100 days after June 9? (September 17: 30 days is July 9, 61 days is August 9, 92 days is September 9, 100 days is September 17.)
34. What is the date 400 days after 5 September 2021? (10 Oct 2022: 365 days is 5 September 2022, 395 days is 5 October 2022, 400 days is 10 Oct 2022.)
35. What is the difference between 8% of \$200 and a quarter of \$50?
(\$3.50: $\$16 - \12.50)
36. King Arthur's round table had a diameter of 4 m. What is the largest number of knights that can sit around it if each knight needs at least 80 cm?
(15: $4 \times \pi \div 0.8 = 15.7$)
37. How many 1 cm cubes will fit into a box 10 cm by 5 cm by 4 cm? (200: $10 \times 5 \times 4$)
38. How many 1 cm cubes will fit into a 4 cm cube box? (64: $4 \times 4 \times 4$)
39. How many 1 cm cubes will fit into a 10 cm cube box? (1000: $10 \times 10 \times 10$)
40. How many 1 cm cubes will fit into a 1 m cube box? (1 000 000: $100 \times 100 \times 100$)
41. How many cubic centimetres in 0.4 m³? (400 000: $1\ 000\ 000 \times 0.4$)
42. How many 1 cm by 1 cm stickers will it take to cover a 3 cm cube? (54: $3 \times 3 \times 6$)
43. How many 1 cm by 1 cm stickers will it take to cover a rectangular prism 10 cm by 5 cm by 4 cm? (220: $10 \times 5 \times 2 + 10 \times 4 \times 2 + 5 \times 4 \times 2$)
44. What is the surface area of a rectangular prism 8 cm by 5 cm by 4 cm?
(184 cm²: $8 \times 5 \times 2 + 8 \times 4 \times 2 + 5 \times 4 \times 2$)

45. 5 children born on the same day have a joint birthday party just for themselves. How many presents will be given? (20: each of the 5 will give 4)
46. 8 children born on the same day have a joint birthday party just for themselves. How many presents will be given? (56: each of the 8 will give 7)
47. 21 children born on the same day have a joint birthday party just for themselves. How many presents will be given? (420: each of the 21 will give 20)
48. 5 people come to a meeting and all shake hands with each other. How many handshakes? (10: $5 \times 4 \div 2$)
49. 8 people come to a meeting and all shake hands with each other. How many handshakes? (28: $8 \times 7 \div 2$)
50. 21 people come to a meeting and all shake hands with each other. How many handshakes? (210: $21 \times 20 \div 2$)
51. Find the sum of the prime numbers between 30 and 50. (199: $31+37+41+43+47$)
52. If BEE = 12, CAT = 24, DOG = 26, and FISH = 42, what does ALLIGATOR equal? (95: A=1, B=2 etc.)
53. Find the 80th number in this pattern: 9, 13, 17, 21, 25, . . . (325: $9+79 \times 4$)
54. What is the date 160 days after March 15? (August 22: 5 30 day steps -> Apr 14, May 14, June 13, July 13, Aug 12; 10 days -> Aug 22)
55. A rectangle is twice as long as it is wide. Its perimeter is 54 cm. What is its area? (162 cm²: 18×9)
56. A rectangle is three times as long as it is wide. Its area is 75 cm². What is its perimeter? (40 cm: 15×5)
57. $1=1$, $1+3=4$, $1+3+5=9$, $1+3+5+7=16$ and so on. What is the sum of the first 8 odd numbers? (64: the sum of the first n odd numbers is n^2)
58. What is the sum of the first 15 odd numbers? (225: 15^2)
59. A man walked 1 kilometre the first day, 3 the next day, 5 the next, 7 the next and so on. How far did he walk in the first 25 days? (625 km: 25^2)
60. How many seconds in a day? (86,400: $24 \times 60 \times 60$)
61. A right-angle triangle has sides of length 5 cm, 12 cm and 13 cm. What is its area? (30 cm²: $12 \times 5 \div 2$)
62. Solve $2^x = 4096$ (12: guess and check or keep multiplying with a calculator)
63. Solve $5^x = 48\,828\,125$ (11: ditto)

64. The product of two successive whole numbers is 552. What are the numbers?
(23, 24: guess and check or finding the square root)
65. The product of two successive whole numbers is 18 360. What are the numbers?
(135, 136: ditto – square root quicker)
66. Write the difference between $4\frac{3}{5}$ and $2\frac{1}{4}$ as a decimal. (0.65: $5.25 - 4.6$)
67. Find the cost of a \$26 shirt with 8% tax added. (\$28.08: 26×1.08)
68. Find the cost of a \$430 burger with 10% tax added. (\$473: 430×1.10)
69. Find the cost of a \$192 dress after a 30% discount. (\$134.40: 192×0.70)
70. After a 20% discount, a game cost \$88. What was the original price?
(\$110: $88 \div 0.80$)
71. Including 15% tax, a game costs \$50.60. What would it cost without the tax?
(\$44: $50.60 \div 1.15$)
72. How many 8 cm ribbons can be made from an 18 m length? (225: $1800 \div 8$)
73. How many 30 cm by 30 cm tiles would it take to cover a 3 m by 4.2 m floor?
(140: $(300 \div 30) \times (420 \div 30)$)
74. How many 1 cm by 1 cm mosaic tiles would it take to cover a 2 m by 2.4 m floor?
(48 000: 200×240)
75. Find the median of the factors of 72. (8.5: 1,2,3,4,6,8, med 9,12,18,24,36,72)
76. How many diagonals can be drawn in a regular hexagon?
(9: $6 \times 3 \div 2$ (3 from each corner, each counted twice))
77. How many diagonals can be drawn in a regular octagon? (20: $8 \times 5 \div 2$)
78. How many diagonals can be drawn in a regular dodecagon (12 sides)?
(54: $12 \times 9 \div 2$)
79. How many diagonals can be drawn in a regular 30-gon (30 sides)?
(405: $30 \times 27 \div 2$)
80. What is the smallest counting number that will divide evenly by both 15 and 24?
(120: 15,30,45,60,75,90,105,120,... 24,48,72,96,120,...)
81. What is the lowest common multiple of 20 and 36? (180: as above)
82. If you roll a die 240 times, how many threes are you most likely to get?
(40: $240 \div 6$)
83. A match box lands flat 84 times out of 120 trials. How many times would it most likely land flat out of 200 trials? (140: $84 \div 120 \times 200$)

84. A clown faces north then turns 585 degrees to his right. Which direction will he be facing then? (SW: $360+180+45$)
85. A clown faces north and then turns 75 degrees to the right over and over again. After how many turns would he be facing south?
(12: keep turning and finding the bearing until facing south)
86. What is the smallest 4-digit number that divides evenly by 7 and by 3?
(1008: check each in turn starting with 1000)
87. If a gallon is 4 quarts, a quart is 2 pints and a pint is 2 cups, write 29 gallons, 2 quarts and 1 cup in pints. (236.5: $29 \times 8 + 2 \times 2 + \frac{1}{2}$)
88. Find the next two numbers in this pattern: 3, 3, 5, 9, 15, 23, ..., ...
(33, 45: add 0,2,4,6,8,10,12...)
89. How many ways can you make 60c using only 5c and 10c coins?
(7: $6 \times 10, 5 \times 10 + 2 \times 5, 4 \times 10 + 4 \times 5, \dots 0 \times 10 + 12 \times 5$)
90. How many ways can you make \$3.60 using only 5c and 20c coins?
(19: 0 to 18 20c coins)
91. What is the lowest counting number that has a remainder of 1 when divided by 2, 3, 4 and 5? (1)
92. Joe has \$12 more than Vanessa. Between them they have \$56. How much does Joe have? (\$34: $34 + 22 = 56$ or Joe has \$6 more than half the money)
93. Katie has \$20 more than Paul. Between them they have \$134. How much does Paul have? (\$57: \$10 less than half the money)
94. $\frac{3}{4}$ of a number is 48. What is the number? (64: $48 \div 3 \times 4$)
95. The product of two consecutive numbers is 506. What is their sum?
(45: the square root of 506 is between 22 and 23)
96. If 3 people can pick 12 tons of grapes between them in a day, how many tons will 5 people be able to pick in 2 days? (40: $12 \div 3 \times 5 \times 2$)
97. What is $\frac{1}{2} + \frac{1}{3}$ as a percent to two decimal places? (83.33%: $50 + 33.33$)
98. What four consecutive numbers have a total of 62? (14, 15, 16, 17: $62 \div 4 = 15.5$)
99. What four consecutive numbers have a total of 119? (28-31: $119 \div 4 = 29.75$)
100. What five consecutive numbers have a total of 1255? (249-253: $1255 \div 5 = 251$)
101. 12 is $\frac{2}{5}$ of what number? (30: $12 \div 2 \times 5$)
102. What is 20% of $\frac{3}{4}$ of 0.6 as a decimal? (0.09: $0.6 \times 0.2 \times 0.75$)
103. What is $\frac{2}{5}$ of 40% of 0.4 as a percent? (6.4%: $40\% \times 0.4 \times 0.4$)

104. What is 0.5 of 15% of $\frac{3}{4}$ as a common fraction in simplest form?
($\frac{9}{160}$: $\frac{3}{4} \times \frac{3}{20} \times \frac{1}{2}$)
105. A rectangular tank is 30 cm wide, 50 cm long and holds 72 litres of water. How tall is it? (48 cm: $72000 \div 30 \div 50$)
106. A rectangular tank is 3 m wide, 5 m long and holds 66 000 litres of water. How tall is it? (4.4 m: $66 \div 3 \div 5$)
107. What two square numbers add up to 100? (36 and 64: trial and error)
108. What two square numbers add up to 370 (289, 81: trial and error)
109. Solve for whole numbers x and y : $x^2 + y^2 = 365$ (13, 14: trial and error)
110. Solve for whole numbers x and y : $x^3 + y^3 = 1729$
(9,10 or 1,12 trial and error - two solutions)
111. How much more is a quarter of 28 471 than a quarter of 28 451?
(5: $\frac{1}{4}$ of (28471–28451))
112. Pluto is 40 times as far from the sun as Earth. If sunlight takes 8 minutes to get to Earth, how many hours and minutes does it take to get to Pluto?
(5 h 20 min: $8 \times 40 = 320$ min = 5h 20 min)
113. Light travels 300 000 km per second. A light year is how far it travels in a year. Our galaxy is 100 000 light years across. What's that roughly in kilometres?
(10^{18} : $300\,000 \times 60 \times 60 \times 24 \times 365 \times 100\,000$)
114. What number must n be if $n+2n+3n+4n$ is 40 more than $n+2n+3n-4n$.
(5: $8n=40$)
115. A mower takes petrol and oil in the ratio 25:1. How many mL of oil are put with 5 L of petrol? (200: $5000 \div 25$)
116. Write down the first 6 multiples of each of the numbers from 1 to 6. What are the two modes of these numbers? (**6,12**: 1,2,3,4,5,**6**,2,4,**6**,8,10,**12**,3,**6**,9,**12**,15,18,4,8,**12**,16,20,24,5,10,15,20,25,30,**6,12**,18,24,30,36)
117. How many edges are there on a regular octahedron (eight triangular faces)?
(12: 8 faces, 3 edges each, each edge shared between 2 faces, so $8 \times 3 \div 2$)
118. A UK gallon is about 4.5 litres. To the nearest gallon, how much is 100 litres?
(22: $100 \div 4.5 = 22.22\dots$)
119. An American gallon is about 3.8 litres. To the nearest gallon, how much is 100 litres? (26: $100 \div 3.8 = 26.31\dots$)
120. In a tank of 100 fish, 99% are blue. How many blue fish must be removed so that 98% are blue? (50: change 99 blue, 1 not blue to 49 blue, 1 not blue)

121. In a tank of 100 fish, 80% are blue. How many blue fish must be removed so that 75% are blue? (20: change 80 blue, 20 not blue to 60 blue, 20 not blue)
122. In a tank of 200 fish, 55% are blue. How many blue fish must be removed so that 50% are blue? (20: change 110 blue, 90 not blue to 90 blue, 90 not blue)
123. In a tank of 100 fish, 80% are blue. How many blue fish must be added so that 90% are blue? (100: change 80 blue, 20 not blue to 180 blue, 20 not blue)
124. Find the next two numbers in this pattern: 13, 10, 9, 10, 13, 18, 25, ...
(34, 45: differences go $-3, -1, 1, 3, 5, 7, 9, 11, \dots$)
125. Find the next two numbers in this pattern: 23, 31, 36, 38, 37, 33, ...
(26, 16: differences go $8, 5, 2, -1, -4, -7, -10, \dots$)
126. How many ways can 4 prisoners be put into 4 cells, one per cell?
(24: 4 choices of cell for the first prisoner, 3 for the second, 2 for the third, 1 for the last – $4 \times 3 \times 2 \times 1 = 24$)
127. How many ways can 5 prisoners be put into 5 cells, one per cell?
(120: $5 \times 4 \times 3 \times 2 \times 1 = 120$)
128. Find the next two numbers in this pattern: 1, 2, 6, 24, 120, 720, ...
(5040, 40 320: multiplying by 3)
129. How many ways can 6 prisoners be put into 6 cells, one per cell?
(720: $6 \times 5 \times 4 \times 3 \times 2 \times 1 = 720$)
130. How many ways can 2 prisoners be put into 4 cells, no more than one per cell?
(12: 4 choices for the first prisoner, 3 for the second – $4 \times 3 = 12$)
131. Find the next two numbers in this pattern: 5, 15, 45, 135, 405, ...
(1215, 3645: multiplying by 3)
132. Find the next two numbers in this pattern: 1, 8, 27, 64, 125, ...
(216, 343: $1^3, 2^3, 3^3, 4^3, 5^3, 6^3, 7^3 \dots$)
133. Find the next two letters in this pattern: j, o, t, y, d, i, ...
(n, s: moving 5 letters through the alphabet each step)
134. How many ways can 3 prisoners be put into 6 cells, no more than one per cell?
(120: $6 \times 5 \times 4$)
135. How many ways can 4 prisoners be put into 4 cells if more than one can go into a cell? (256: each prisoner has a choice of four cells – $4 \times 4 \times 4 \times 4 = 256$)
136. How many ways can 4 prisoners be put into 5 cells if more than one can go into a cell? (625: $5 \times 5 \times 5 \times 5 = 625$)