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Year 10 Maths Assignment

Task 1

a) Compile an uninterrupted sequence of whole numbers up to 25 using R1

0 = 4-4+4-4
1 = 4-4+4/4
2 = (4x4)/(4+4)
3 = (4+4+4)/4
4 = 4+4-√4-√4
5 = 4/4+√4+√4
6 = 4+4-4+√4
7 = 4+√4+(4/4)
8 = (4x4)-4-4
9 = 4+4+(4/4)
10 = 4+4+4-√4
11 = 44/(√4+√4)
12 = (4(4+√4))/√4
13 = 44/4 + √4
14 = 4(√4+√4)-√4
15 = 4x4 - (4/4)
16 = 4x4+4-4
17 = 4x4 + 4/4
18 = 44/√4 -4
19 = 4x4+4-
√√√√√√√√√√√√√√√√√√4
20 = (44-4)/√4
21 = (44-√4)/√4
22 = 44/(4-√4)
23 = (44+√4)/√4
24 = (44+4)/√4
25 = (4+ 4/4)$^{\sqrt{4}}$

b) Using R2 to generate four different ways to create one number

.

40 = 4(4/0.4)+4
40 = (√4+√4)(4/0.4)
40 = (4+√4+4)x4
40 = (4!-4)x√4

Task 2

What happens when the process is followed for a different starting word? By using two (2) of your own examples, does it always happen?

EXTERMINATED→TWELVE→SIX→THREE→FOUR

DISPENSER→NINE→FOUR

Yes, it always happens. Four is the only number where it represents the number of letters its word has.

Task 3

Perform the Kaprekar process for 2 other four digit starting numbers. When the process continues indefinitely, what happens?

1824→7173→6354→3087→8352→6174

1002→2088→8514→7083→8352→6174

When the process continues indefinitely, it has reached a number where the highest possible number for those digits subtract the lowest possible number for those digits end up in the same number.

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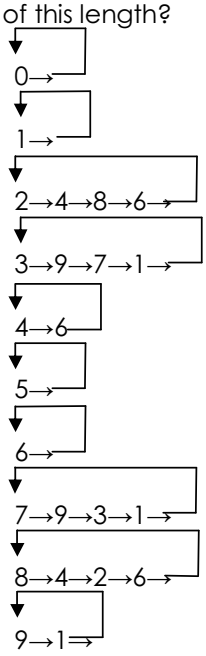
Task 4

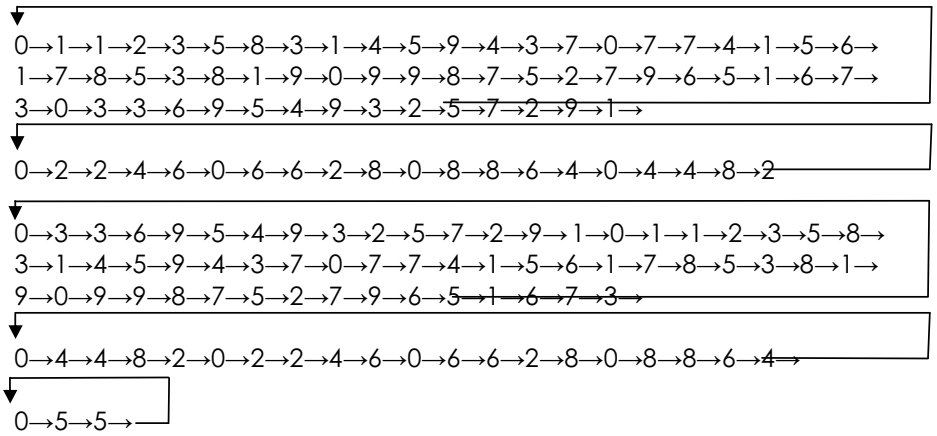
What is the longest length bracelet and how many different bracelets are there of this length?



The longest length bracelet for the above process is four numbers. There are four numbers that can make this length (2,3,7,8).

Task 5

What is the shortest length bracelet formed fro m the last digits of a generalised Fibonacci sequence?



0→6→6→2→ **Too Long**

0→7→7→4

0→8→8→6

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0→9→9→8

1→1→2→3

1→2→3→5

1→3→4→7

1→4→5→9

1→5→6→1→7

1→6→7→3

1→7→8→5

1→8→9→7

1→9→0→9

2→2→4→6

2→3→5→8

2→4→6→0

2→5→7→2→9

2→6→8→4

2→7→9→6

2→8→0→8

2→9→1→0

3→3→6→9

3→4→7→1

3→5→8→3

3→6→9→5

3→7→0→7

3→8→1→9

3→9→2→1

4→4→8→2

4→5→9→4→3

4→6→0→6

4→7→1→8

4→8→2→0

4→9→3→2

5→5→0

5→6→1→7

5→7→2→9

5→8→3→1

5→9→4→3

6→6→2→8

6→7→3→0→3

6→8→4→2

6→9→5→4

7→7→4→1

7→8→5→3

7→9→6→5

8→8→6→4

8→9→7→6

9→9→8→7

The shortest length bracelet formed from the last digits of a generalised Fibonacci sequence is three numbers. Two bracelets can do this – one

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beginning with 0→5, one beginning with 5→5. But these are essentially two starting points of the same chain.

Task 6

Abbreviations: Happy Number - HN

10,13,23,49,97 are happy numbers under 100 (given)

4,16,20,37,42,58,89 are not happy numbers under 100 (given)

99→162→41→17→50→25→29→85→89 **89 is not a HN, therefore 99 is not**

98→145→42 **42 is not a HN, therefore 98 is not**

97→**Happy Number (Given) (1)**

96→117→51→26→40→16→ **16 is not a HN, therefore 96 is not**

95→106→37→58→89→145→42 **42 is not a HN, therefore 95 is not**

94→97→**97 is a HN, therefore 94 is one (2)**

93→90→81→65→61→37→ **37 is not a HN, therefore 93 is not**

92→85→89 **89 is not a HN, therefore 92 is not**

91→82→68→100→10→1 **HN (3)**

90→81→ **81 is not a HN, therefore 90 is not**

89→145→42 **42 is not a HN, therefore 89 is not**

88→128→69→117→51→26→40→16 **16 is not a HN, therefore 88 is not**

87→113→11→2→4 **4 is not a HN, therefore 87 is not**

86→100→10→1 **HN (4)**

85→89 **89 is not a HN, therefore 85 is not**

84→80→64→52→29→85 **85 is not a HN, therefore 84 is not**

83→73→58→89 **89 is not a HN, therefore 83 is not**

82→68→100→10→1 **HN (5)**

The five largest happy numbers are 97, 94, 91, 86 and 82.

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Table of Outcomes

1→1	21→3	41→17	61→37	81→65
2→4	22→6	42→20	62→40	82→68
3→9	23→13	43→25	63→45	83→73
4→16	24→20	44→32	64→52	84→80
5→25	25→29	45→41	65→61	85→89
6→36	26→40	46→52	66→72	86→100→10
7→49	27→53	47→65	67→85	87→113→11
8→64	28→68	48→80	68→100→10	88→128→69
9→81	29→85	49→97	69→117→51	89→145→42
10→1	30→9	50→25	70→49	90→81
11→2	31→10	51→26	71→50	91→82
12→5	32→13	52→29	72→53	92→85
13→10	33→18	53→34	73→58	93→90
14→17	34→25	54→41	74→65	94→97
15→26	35→34	55→50	75→74	95→106→37
16→37	36→45	56→61	76→85	96→117→51
17→50	37→58	57→74	77→98	97→130→10
18→65	38→73	58→89	78→113→11	98→145→42
19→82	39→90	59→106→37	79→130→10	99→162→41
20→2	40→16	60→36	80→64	

Task 7

Abbreviations: 1 – Outcome 1
2 – Outcome 2
3 – Outcome 3

One of the three outcomes are given

1) The numbers end up on the number one (1). They are happy numbers.
(See Task 6 for evidence)

99→90→81→9 **Does not fit in rule 1, therefore must be rule 2.**
98→73→16→37→52→9→81→9 (2)
97→58→59→86→44→20→2→4→16… (2) **16 is in rule 2, therefore 97 must be**
96→45→29→83→17→50→5→25→27→51→6→36→39→84→24→18→65→31→4→16… (2)
95→34→19→82→12→5… (2)
94→25… (2)
93→18→65… (2)
92→13→10→1 (1)
91→10→1(1)
90→9→81→65→31→4… (2)
89→89→ **Does not fit in either R1 or R2. Therefore this must be the new rule. (3)**

The three outcomes are:

1) The numbers end up on the number one (1). They are happy numbers.
(See Task 6 for evidence)
2) The numbers end in a loop of two (2) numbers (81,9)
3) The number ends in a one number loop (89)

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Task 8

99→80→88→60→66→20→22→40→44→80→ **1 is already given. It ends in a loop of 8 numbers (80,88,60,66,20,22,40,44).**

98→71→86→42→62→84→24→ **2 ends in a loop of three nu mbers (62,84,24).**

97→62→(2)

96→53→82→06→66→(1)

95→44→(1)

94→35→82→(1)

93→26→84→(2)

92→17→86→(2)

91→08→88→(1)

90→99→(1)

88→(1)

77→40→(1)

66→(1)

55→00→00 **New Rule. It ends in a loop of 1 number (00).**

44→80→(1)

33→60→(1)

22→40→(1)

11→20→(1)

The two other outcomes for this altered rule are:

1) The numbers end in a loop of 3 numbers (62,84,24)
2) The number ends in a loop of 1 number (00).

END OF ASSIGNMENT

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