

Cyclic numbers to magic squares

Here is how to create a prime number magic square. Starting with the collection of reciprocals of cyclic prime numbers only, they are the ones with the maximum number of repeating digits which is one less than prime number, as an example 7 has 6 repeating digits. Starting with the repeating digits block and treating them as a whole number and multiplying each line by 1 through one less than the prime number. Here are the first 8 samples over the next five pages, more than 97 just too large to print on a page. On the right side of the first five I have change the order of the lines to better show how the columns also have the same numbers and the same sum.

Starting with the cyclic prime number value P then the line and column sum is $4.5 * (P - 1)$. The first sample $4.5 * (7 - 1) = 4.5 * 6 = 27$ which is the sum. Although I have not proved this it is just an observation at this point, I have checked the 35 cyclic numbers up to 499 and it remains true.

Magic square for prime number = 7

Line and column sum = 27

142857	142857
285714	428571
428571	285714
571428	857142
714285	571428
857142	714285

Magic square for prime number = 17

Line and column sum = 72

0588235294117647	0588235294117647
1176470588235294	5882352941176470
1764705882352941	8823529411764705
2352941176470588	8235294117647058
2941176470588235	2352941176470588
3529411764705882	3529411764705882
4117647058823529	5294117647058823
4705882352941176	2941176470588235
5294117647058823	9411764705882352
5882352941176470	4117647058823529
6470588235294117	1176470588235294
7058823529411764	1764705882352941
7647058823529411	7647058823529411
8235294117647058	6470588235294117
8823529411764705	4705882352941176
9411764705882352	7058823529411764

Magic square for prime number = 19

Line and column sum = 81

052631578947368421	052631578947368421
105263157894736842	526315789473684210
157894736842105263	263157894736842105
210526315789473684	631578947368421052
263157894736842105	315789473684210526
315789473684210526	157894736842105263

368421052631578947
421052631578947368
473684210526315789
526315789473684210
578947368421052631
631578947368421052
684210526315789473
736842105263157894
789473684210526315
842105263157894736
894736842105263157
947368421052631578

578947368421052631
789473684210526315
894736842105263157
947368421052631578
473684210526315789
736842105263157894
368421052631578947
684210526315789473
842105263157894736
421052631578947368
210526315789473684
105263157894736842

Magic square for prime number = 23
Line and column sum = 99

0434782608695652173913
0869565217391304347826
1304347826086956521739
1739130434782608695652
2173913043478260869565
2608695652173913043478
3043478260869565217391
3478260869565217391304
3913043478260869565217
4347826086956521739130
4782608695652173913043
5217391304347826086956
5652173913043478260869
6086956521739130434782
6521739130434782608695
6956521739130434782608
7391304347826086956521
7826086956521739130434
8260869565217391304347
8695652173913043478260
9130434782608695652173
9565217391304347826086

0434782608695652173913
4347826086956521739130
3478260869565217391304
4782608695652173913043
7826086956521739130434
8260869565217391304347
2608695652173913043478
6086956521739130434782
0869565217391304347826
8695652173913043478260
6956521739130434782608
9565217391304347826086
5652173913043478260869
6521739130434782608695
5217391304347826086956
2173913043478260869565
1739130434782608695652
7391304347826086956521
3913043478260869565217
9130434782608695652173
1304347826086956521739
3043478260869565217391

Magic square for prime number = 29
Line and column sum = 126

0344827586206896551724137931
0689655172413793103448275862
1034482758620689655172413793
1379310344827586206896551724
1724137931034482758620689655
2068965517241379310344827586
2413793103448275862068965517
2758620689655172413793103448
3103448275862068965517241379
3448275862068965517241379310
3793103448275862068965517241
4137931034482758620689655172
4482758620689655172413793103
4827586206896551724137931034
5172413793103448275862068965
5517241379310344827586206896
5862068965517241379310344827
6206896551724137931034482758
6551724137931034482758620689

0344827586206896551724137931
3448275862068965517241379310
4482758620689655172413793103
4827586206896551724137931034
8275862068965517241379310344
2758620689655172413793103448
7586206896551724137931034482
5862068965517241379310344827
8620689655172413793103448275
6206896551724137931034482758
2068965517241379310344827586
0689655172413793103448275862
6896551724137931034482758620
8965517241379310344827586206
9655172413793103448275862068
6551724137931034482758620689
5517241379310344827586206896
5172413793103448275862068965
1724137931034482758620689655

6896551724137931034482758620
7241379310344827586206896551
7586206896551724137931034482
7931034482758620689655172413
8275862068965517241379310344
8620689655172413793103448275
8965517241379310344827586206
9310344827586206896551724137
9655172413793103448275862068

7241379310344827586206896551
2413793103448275862068965517
4137931034482758620689655172
1379310344827586206896551724
3793103448275862068965517241
7931034482758620689655172413
9310344827586206896551724137
3103448275862068965517241379
1034482758620689655172413793

Magic square for prime number = 47

Line and column sum = 207

0212765957446808510638297872340425531914893617
0425531914893617021276595744680851063829787234
0638297872340425531914893617021276595744680851
0851063829787234042553191489361702127659574468
1063829787234042553191489361702127659574468085
1276595744680851063829787234042553191489361702
1489361702127659574468085106382978723404255319
1702127659574468085106382978723404255319148936
1914893617021276595744680851063829787234042553
2127659574468085106382978723404255319148936170
2340425531914893617021276595744680851063829787
2553191489361702127659574468085106382978723404
2765957446808510638297872340425531914893617021
2978723404255319148936170212765957446808510638
3191489361702127659574468085106382978723404255
3404255319148936170212765957446808510638297872
3617021276595744680851063829787234042553191489
3829787234042553191489361702127659574468085106
4042553191489361702127659574468085106382978723
4255319148936170212765957446808510638297872340
4468085106382978723404255319148936170212765957
4680851063829787234042553191489361702127659574
4893617021276595744680851063829787234042553191
5106382978723404255319148936170212765957446808
5319148936170212765957446808510638297872340425
5531914893617021276595744680851063829787234042
5744680851063829787234042553191489361702127659
5957446808510638297872340425531914893617021276
6170212765957446808510638297872340425531914893
6382978723404255319148936170212765957446808510
6595744680851063829787234042553191489361702127
6808510638297872340425531914893617021276595744
7021276595744680851063829787234042553191489361
7234042553191489361702127659574468085106382978
7446808510638297872340425531914893617021276595
7659574468085106382978723404255319148936170212
7872340425531914893617021276595744680851063829
8085106382978723404255319148936170212765957446
8297872340425531914893617021276595744680851063
8510638297872340425531914893617021276595744680
8723404255319148936170212765957446808510638297
8936170212765957446808510638297872340425531914
9148936170212765957446808510638297872340425531
9361702127659574468085106382978723404255319148
9574468085106382978723404255319148936170212765
9787234042553191489361702127659574468085106382

Magic square for prime number = 59

Line and column sum = 261

0169491525423728813559322033898305084745762711864406779661
0338983050847457627118644067796610169491525423728813559322
0508474576271186440677966101694915254237288135593220338983
0677966101694915254237288135593220338983050847457627118644
0847457627118644067796610169491525423728813559322033898305
1016949152542372881355932203389830508474576271186440677966
1186440677966101694915254237288135593220338983050847457627
1355932203389830508474576271186440677966101694915254237288
1525423728813559322033898305084745762711864406779661016949
1694915254237288135593220338983050847457627118644067796610
1864406779661016949152542372881355932203389830508474576271
2033898305084745762711864406779661016949152542372881355932
2203389830508474576271186440677966101694915254237288135593
2372881355932203389830508474576271186440677966101694915254
2542372881355932203389830508474576271186440677966101694915
2711864406779661016949152542372881355932203389830508474576
2881355932203389830508474576271186440677966101694915254237
3050847457627118644067796610169491525423728813559322033898
3220338983050847457627118644067796610169491525423728813559
3389830508474576271186440677966101694915254237288135593220
3559322033898305084745762711864406779661016949152542372881
3728813559322033898305084745762711864406779661016949152542
3898305084745762711864406779661016949152542372881355932203
4067796610169491525423728813559322033898305084745762711864
4237288135593220338983050847457627118644067796610169491525
4406779661016949152542372881355932203389830508474576271186
4576271186440677966101694915254237288135593220338983050847
4745762711864406779661016949152542372881355932203389830508
4915254237288135593220338983050847457627118644067796610169
5084745762711864406779661016949152542372881355932203389830
5254237288135593220338983050847457627118644067796610169491
5423728813559322033898305084745762711864406779661016949152
5593220338983050847457627118644067796610169491525423728813
5762711864406779661016949152542372881355932203389830508474
5932203389830508474576271186440677966101694915254237288135
6101694915254237288135593220338983050847457627118644067796
6271186440677966101694915254237288135593220338983050847457
6440677966101694915254237288135593220338983050847457627118
6610169491525423728813559322033898305084745762711864406779
6779661016949152542372881355932203389830508474576271186440
6949152542372881355932203389830508474576271186440677966101
7118644067796610169491525423728813559322033898305084745762
7288135593220338983050847457627118644067796610169491525423
7457627118644067796610169491525423728813559322033898305084
7627118644067796610169491525423728813559322033898305084745
7796610169491525423728813559322033898305084745762711864406
7966101694915254237288135593220338983050847457627118644067
8135593220338983050847457627118644067796610169491525423728
8305084745762711864406779661016949152542372881355932203389
8474576271186440677966101694915254237288135593220338983050
8644067796610169491525423728813559322033898305084745762711
8813559322033898305084745762711864406779661016949152542372
8983050847457627118644067796610169491525423728813559322033
9152542372881355932203389830508474576271186440677966101694
9322033898305084745762711864406779661016949152542372881355
9491525423728813559322033898305084745762711864406779661016
9661016949152542372881355932203389830508474576271186440677
9830508474576271186440677966101694915254237288135593220338

Magic square for prime number = 61

Line and column sum = 270

016393442622950819672131147540983606557377049180327868852459
032786885245901639344262295081967213114754098360655737704918
049180327868852459016393442622950819672131147540983606557377
065573770491803278688524590163934426229508196721311475409836
081967213114754098360655737704918032786885245901639344262295
098360655737704918032786885245901639344262295081967213114754
114754098360655737704918032786885245901639344262295081967213
131147540983606557377049180327868852459016393442622950819672
147540983606557377049180327868852459016393442622950819672131
163934426229508196721311475409836065573770491803278688524590
180327868852459016393442622950819672131147540983606557377049
196721311475409836065573770491803278688524590163934426229508
213114754098360655737704918032786885245901639344262295081967
229508196721311475409836065573770491803278688524590163934426
245901639344262295081967213114754098360655737704918032786885
262295081967213114754098360655737704918032786885245901639344
278688524590163934426229508196721311475409836065573770491803
295081967213114754098360655737704918032786885245901639344262
311475409836065573770491803278688524590163934426229508196721
327868852459016393442622950819672131147540983606557377049180
344262295081967213114754098360655737704918032786885245901639
360655737704918032786885245901639344262295081967213114754098
377049180327868852459016393442622950819672131147540983606557
393442622950819672131147540983606557377049180327868852459016
409836065573770491803278688524590163934426229508196721311475
426229508196721311475409836065573770491803278688524590163934
442622950819672131147540983606557377049180327868852459016393
459016393442622950819672131147540983606557377049180327868852
475409836065573770491803278688524590163934426229508196721311
491803278688524590163934426229508196721311475409836065573770
508196721311475409836065573770491803278688524590163934426229
524590163934426229508196721311475409836065573770491803278688
540983606557377049180327868852459016393442622950819672131147
557377049180327868852459016393442622950819672131147540983606
573770491803278688524590163934426229508196721311475409836065
590163934426229508196721311475409836065573770491803278688524
606557377049180327868852459016393442622950819672131147540983
622950819672131147540983606557377049180327868852459016393442
639344262295081967213114754098360655737704918032786885245901
655737704918032786885245901639344262295081967213114754098360
672131147540983606557377049180327868852459016393442622950819
688524590163934426229508196721311475409836065573770491803278
704918032786885245901639344262295081967213114754098360655737
721311475409836065573770491803278688524590163934426229508196
737704918032786885245901639344262295081967213114754098360655
754098360655737704918032786885245901639344262295081967213114
770491803278688524590163934426229508196721311475409836065573
786885245901639344262295081967213114754098360655737704918032
803278688524590163934426229508196721311475409836065573770491
819672131147540983606557377049180327868852459016393442622950
836065573770491803278688524590163934426229508196721311475409
852459016393442622950819672131147540983606557377049180327868
868852459016393442622950819672131147540983606557377049180327
885245901639344262295081967213114754098360655737704918032786
901639344262295081967213114754098360655737704918032786885245
918032786885245901639344262295081967213114754098360655737704
934426229508196721311475409836065573770491803278688524590163
950819672131147540983606557377049180327868852459016393442622
967213114754098360655737704918032786885245901639344262295081
983606557377049180327868852459016393442622950819672131147540

711340206185567010309278350515463917525773195876288659793814432989690721649484536082474226804123
721649484536082474226804123711340206185567010309278350515463917525773195876288659793814432989690
731958762886597938144329896907216494845360824742268041237113402061855670103092783505154639175257
742268041237113402061855670103092783505154639175257731958762886597938144329896907216494845360824
752577319587628865979381443298969072164948453608247422680412371134020618556701030927835051546391
762886597938144329896907216494845360824742268041237113402061855670103092783505154639175257731958
773195876288659793814432989690721649484536082474226804123711340206185567010309278350515463917525
783505154639175257731958762886597938144329896907216494845360824742268041237113402061855670103092
793814432989690721649484536082474226804123711340206185567010309278350515463917525773195876288659
804123711340206185567010309278350515463917525773195876288659793814432989690721649484536082474226
814432989690721649484536082474226804123711340206185567010309278350515463917525773195876288659793
824742268041237113402061855670103092783505154639175257731958762886597938144329896907216494845360
835051546391752577319587628865979381443298969072164948453608247422680412371134020618556701030927
845360824742268041237113402061855670103092783505154639175257731958762886597938144329896907216494
855670103092783505154639175257731958762886597938144329896907216494845360824742268041237113402061
865979381443298969072164948453608247422680412371134020618556701030927835051546391752577319587628
876288659793814432989690721649484536082474226804123711340206185567010309278350515463917525773195
886597938144329896907216494845360824742268041237113402061855670103092783505154639175257731958762
896907216494845360824742268041237113402061855670103092783505154639175257731958762886597938144329
907216494845360824742268041237113402061855670103092783505154639175257731958762886597938144329896
917525773195876288659793814432989690721649484536082474226804123711340206185567010309278350515463
927835051546391752577319587628865979381443298969072164948453608247422680412371134020618556701030
938144329896907216494845360824742268041237113402061855670103092783505154639175257731958762886597
948453608247422680412371134020618556701030927835051546391752577319587628865979381443298969072164
958762886597938144329896907216494845360824742268041237113402061855670103092783505154639175257731
969072164948453608247422680412371134020618556701030927835051546391752577319587628865979381443298
979381443298969072164948453608247422680412371134020618556701030927835051546391752577319587628865
989690721649484536082474226804123711340206185567010309278350515463917525773195876288659793814432

Here is how to create a prime number magic square. Starting with the collection of reciprocals of cyclic prime numbers only, they are the ones with the maximum number of repeating digits which is one less than prime number, as an example 7 has 6 repeating digits. Starting with the repeating digits block and treating them as a whole number and multiplying each line by 1 through one less than the prime number. Here are the first 5 samples over the next five pages, more than 29 just too large to print on a page. On the right side of the first five I have change the order of the lines to better show how the columns also have the same numbers and the same sum. I have arrows so you can draw lines to show the connecting values and show that nothing has been add or deleted.

Magic square for prime number = 7
Line and column sum = 27

142857←	→142857
285714←	→428571
428571←	→285714
571428←	→857142
714285←	→571428
857142←	→714285

Magic square for prime number = 17
Line and column sum = 72

0588235294117647←	→0588235294117647
1176470588235294←	→5882352941176470
1764705882352941←	→8823529411764705
2352941176470588←	→8235294117647058
2941176470588235←	→2352941176470588
3529411764705882←	→3529411764705882
4117647058823529←	→5294117647058823
4705882352941176←	→2941176470588235
5294117647058823←	→9411764705882352
5882352941176470←	→4117647058823529
6470588235294117←	→1176470588235294
7058823529411764←	→1764705882352941
7647058823529411←	→7647058823529411
8235294117647058←	→6470588235294117
8823529411764705←	→4705882352941176
9411764705882352←	→7058823529411764

Magic square for prime number = 19
Line and column sum = 81

052631578947368421←	→052631578947368421
105263157894736842←	→526315789473684210
157894736842105263←	→263157894736842105
210526315789473684←	→631578947368421052
263157894736842105←	→315789473684210526
315789473684210526←	→157894736842105263
368421052631578947←	→578947368421052631
421052631578947368←	→789473684210526315
473684210526315789←	→894736842105263157
526315789473684210←	→947368421052631578
578947368421052631←	→473684210526315789
631578947368421052←	→736842105263157894
684210526315789473←	→368421052631578947
736842105263157894←	→684210526315789473
789473684210526315←	→842105263157894736

842105263157894736-
894736842105263157-
947368421052631578-

→421052631578947368
→210526315789473684
→105263157894736842

Magic square for prime number = 23
Line and column sum = 99

0434782608695652173913-
0869565217391304347826-
1304347826086956521739-
1739130434782608695652-
2173913043478260869565-
2608695652173913043478-
3043478260869565217391-
3478260869565217391304-
3913043478260869565217-
4347826086956521739130-
4782608695652173913043-
5217391304347826086956-
5652173913043478260869-
6086956521739130434782-
6521739130434782608695-
6956521739130434782608-
7391304347826086956521-
7826086956521739130434-
8260869565217391304347-
8695652173913043478260-
9130434782608695652173-
9565217391304347826086-

→0434782608695652173913
→4347826086956521739130
→3478260869565217391304
→4782608695652173913043
→7826086956521739130434
→8260869565217391304347
→2608695652173913043478
→6086956521739130434782
→0869565217391304347826
→8695652173913043478260
→6956521739130434782608
→9565217391304347826086
→5652173913043478260869
→6521739130434782608695
→5217391304347826086956
→2173913043478260869565
→1739130434782608695652
→7391304347826086956521
→3913043478260869565217
→9130434782608695652173
→1304347826086956521739
→3043478260869565217391

Magic square for prime number = 29
Line and column sum = 126

0344827586206896551724137931-
0689655172413793103448275862-
1034482758620689655172413793-
1379310344827586206896551724-
1724137931034482758620689655-
2068965517241379310344827586-
2413793103448275862068965517-
2758620689655172413793103448-
3103448275862068965517241379-
3448275862068965517241379310-
3793103448275862068965517241-
4137931034482758620689655172-
4482758620689655172413793103-
4827586206896551724137931034-
5172413793103448275862068965-
5517241379310344827586206896-
5862068965517241379310344827-
6206896551724137931034482758-
6551724137931034482758620689-
6896551724137931034482758620-
7241379310344827586206896551-
7586206896551724137931034482-
7931034482758620689655172413-
8275862068965517241379310344-
8620689655172413793103448275-
8965517241379310344827586206-
9310344827586206896551724137-
9655172413793103448275862068-

→0344827586206896551724137931
→3448275862068965517241379310
→4482758620689655172413793103
→4827586206896551724137931034
→8275862068965517241379310344
→2758620689655172413793103448
→7586206896551724137931034482
→5862068965517241379310344827
→8620689655172413793103448275
→6206896551724137931034482758
→2068965517241379310344827586
→0689655172413793103448275862
→6896551724137931034482758620
→8965517241379310344827586206
→9655172413793103448275862068
→6551724137931034482758620689
→5517241379310344827586206896
→5172413793103448275862068965
→1724137931034482758620689655
→7241379310344827586206896551
→2413793103448275862068965517
→4137931034482758620689655172
→1379310344827586206896551724
→3793103448275862068965517241
→7931034482758620689655172413
→9310344827586206896551724137
→3103448275862068965517241379
→1034482758620689655172413793