

FIRST EIGHT DIGIT PRIME IN CONSECUTIVE DIGITS OF EULER CONSTANT

Computing e

The number e is the base of natural logarithms and one of the most important numbers. The first few digits of e are **2.718281828459045235360...**, but the constant is irrational, meaning that its digits never fall into a repeating pattern. The constant has been computed to an absurd number of digits over the years, but although you can find lists of the first few million digits of e on the web, for this assignment you must compute it directly. There are many algorithms for generating the digits of e , but for this assignment you should use the following simple formulation for computing e :

$$e = \sum_{i=0}^{\infty} \left(\frac{1}{i!} \right)$$

or, in other words

$$e = \frac{1}{0!} + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} + \frac{1}{5!} + \dots$$

The more terms you calculate, the closer you will get to the true value of e . You will only arrive at the exact value of e if you carry on adding up the sequence forever.

In this coding exercise you will develop a class, EulerPuzzle, that has two methods.

The first method **BigDecimal calculateE()** will calculate e constant to 10.000-digit precision. The second method **int findPrime(BigDecimal e)** that finds the first 8-digit prime found in its fractional digits and returns the starting index otherwise return -1. The index of the first digit of fraction is 0.

You can develop other helper methods and fields, if you need.

Your **BigDecimal calculateE()** method should iterate for first **2000** terms.

1. The incomplete EulerPuzzle class is as below.

```
import java.math.BigDecimal;
import java.math.BigInteger;
import java.math.MathContext;

public class EulerPuzzle {
    public final int NUM_OF_DIGITS = 10000;
    public final int NUMBER_OF_TERMS = 2000;

    public static void main(String[] args) {
        EulerPuzzle eulerPuzzle = new EulerPuzzle();
        System.out.println(eulerPuzzle.calculateE());
        System.out.println(eulerPuzzle.findPrime(eulerPuzzle.calculateE()));
    }

    public BigDecimal calculateE() {
        return e;
    }

    public int findPrime(BigDecimal e) {
```

```
    return -1;
  }
}
```

2. The output of the above code should be as below

```
2.718281828459045235360287471352662497757247093699959574966967627724
0766303535475945713821785251664274274663919320030599218174135966290
4357290033429526059563073813232862794349076323382988075319525101901
1573834187930702154089149934884167509244761460668082264800168477411
8537423454424371075390777449920695517027618386062613313845830007520
4493382656029760673711320070932870912744374704723069697720931014169
2836819025515108657463772111252389784425056953696770785449969967946
8644549059879316368892300987931277361782154249992295763514822082698
9519366803318252886939849646510582093923982948879332036250944311730
1238197068416140397019837679320683282376464804295311802328782509819
4558153017567173613320698112509961818815930416903515988885193458072
7386673858942287922849989208680582574927961048419844436346324496848
7560233624827041978623209002160990235304369941849146314093431738143
6405462531520961836908887070167683964243781405927145635490613031072
0851038375051011574770417189861068739696552126715468895703503540212
3407849819334321068170121005627880235193033224745015853904730419957
7770935036604169973297250886876966403555707162268447162560798826517
8713419512466520103059212366771943252786753985589448969709640975459
1856956380236370162112047742722836489613422516445078182442352948636
3721417402388934412479635743702637552944483379980161254922785092577
8256209262264832627793338656648162772516401910590049164499828931505
6604725802778631864155195653244258698294695930801915298721172556347
5463964479101459040905862984967912874068705048958586717479854667757
5732056812884592054133405392200011378630094556068816674001698420558
0403363795376452030402432256613527836951177883863874439662532249850
6549958862342818997077332761717839280349465014345588970719425863987
7275471096295374152111513683506275260232648472870392076431005958411
6612054529703023647254929666938115137322753645098889031360205724817
6585118063036442812314965507047510254465011727211555194866850800368
5322818315219600373562527944951582841882947876108526398139559900673
7648292244375287184624578036192981971399147564488262603903381441823
2625150974827987779964373089970388867782271383605772978824125611907
1766394650706330452795466185509666618566470971134447401607046262156
8071748187784437143698821855967095910259686200235371858874856965220
0050311734392073211390803293634479727355955277349071783793421637012
0500545132638354400018632399149070547977805669785335804896690629511
9432473099587655236812859041383241160722602998330535370876138939639
1779574540161372236187893652605381558415871869255386061647798340254
3512843961294603529133259427949043372990857315802909586313826832914
7711639633709240031689458636060645845925126994655724839186564209752
6850823075442545993769170419777800853627309417101634349076964237222
9435236612557250881477922315197477806056967253801718077636034624592
7877846585065605078084421152969752189087401966090665180351650179250
4619501366585436632712549639908549144200014574760819302212066024330
0964127048943903971771951806990869986066365832322787093765022601492
9101151717763594460202324930028040186772391028809786660565118326004
3688508817157238669842242201024950551881694803221002515426494639812
8736776589276881635983124778865201411741109136011649950766290779436
4600585194199856016264790761532103872755712699251827568798930276176
1146162549356495903798045838182323368612016243736569846703785853305
2758333379399075216606923805336988795651372855938834998947074161815
5012539706464817194670834819721448889879067650379590366967249499254
5279033729636162658976039498576741397359441023744329709355477982629
```

6145914429364514286171585873397467918975712119561873857836447584484
2355558105002561149239151889309946342841393608038309166281881150371
5284967059741625628236092168075150177725387402564253470879089137291
7228286115159156837252416307722544063378759310598267609442032619242
8531701878177296023541306067213604600038966109364709514141718577701
4180606443636815464440053316087783143174440811949422975599314011888
6833148328027065538330046932901157441475631399972217038046170928945
7909627166226074071874997535921275608441473782330327033016823719364
8002173285734935947564334129943024850235732214597843282641421684878
7216733670106150942434569844018733128101079451272237378861260581656
6805371439612788873252737389039289050686532413806279602593038772769
7783792868409325365880733988457218746021005311483351323850047827169
3762180049047955979592905916554705057775143081751126989851884087185
6402603530558373783242292418562564425502267215598027401261797192804
7139600689163828665277009752767069777036439260224372841840883251848
7704726384403795301669054659374616193238403638931313643271376888410
2681121989127522305625675625470172508634976536728860596675274086862
7407912856576996313789753034660616669804218267724560530660773899624
2183408598820718646826232150802882863597468396543588566855037731312
9658797581050121491620765676995065971534476347032085321560367482860
8378656803073062657633469774295634643716709397193060876963495328846
8336130388294310408002968738691170666661468000151211434422560238744
7432525076938707777519329994213727721125884360871583483562696166198
0572526612206797540621062080649882918454395301529982092503005498257
0433905535701686531205264956148572492573862069174036952135337325316
6634546658859728665945113644137033139367211856955395210845840724432
3835586063106806964924851232632699514603596037297253198368423363904
6321367101161928217111502828016044880588023820319814930963695967358
3274202498824568494127386056649135252670604623445054922758115170931
4921879592718001940968866986837037302200475314338181092708030017205
9355305207007060722339994639905713115870996357773590271962850611465
1483752620956534671329002599439766311454590268589897911583709341937
0441155121920117164880566945938131183843765605550693145459135564072
8368935332264410700718679891276367186588005862784550675208735184499
2887101879010014786606240518189354048965161319709557524405191330628
9401087471632625922973856045223904389501212826286314635188732749696
8544914324981986263981242791736974874989749776310235375240259534653
6437750990004966067509887678050097321115265662526300268581800541955
7275814723373848796847168063785295599819372455000077877165241863693
7320131311620023309719206618941672543435946238385816918451321703668
3577206421893386250948873330335712730558124732731113699364198871732
4511764850188431408353088800141080656959409687280107268968171377885
6674444698095976957570700555182929076417229205295309613364618982296
5047427378192105574761803228251021227590504328859953715615437478639
8331418282609627383147016676045460744517591412207369774733373338611
6851410132154888797843920786071090316397819198492776299751628536356
0986273707033109823663344149168803455896481548925476029265123665317
4202782838713137828459643232485571341324835500891558663971615620072
3368299063876173901613372362015970600023394574712448645838435550656
4377902627877471159036148238088636225766789663264845108423438397903
0267243354670305906374709375240137030300232697467282591604520396368
2401651055060304464836805292668740274019313036105920116073597892779
3154612982535169829334709055865747782324276768461989375102243023518
8216792385048846733994013347454074517826148209794707292467662938532
0206041083039131464966693851516042629653421800566728897909130598206
0180502712166245704357737172394848775047733953895796085484296500268
0290382240374960548966436880857404025261785270934171655171327754987
2560270836627106149348180674541875915862997261896139547206862757466
2016965228008648167736092963507635948391746864833755222810844313591
5589268562353417591363311706054442650809841747239931810933128482603
2555509748160417183379455241759443783632178837688919496436449678272
3169163572824558681565703735466586538583830557379126832638801920112

1802507133858218877885888520019537956871360984081141734401519848165
3559588585634530913669911913959828719342412981261516589929142854397
8664308264402147448314903546203063239309281495230839582260879626856
9902392216406453698091420739282598823277887456324937136625011866295
2917951424994232760689022476148097949769026797023949908656149309078
9961187275638383007229006905196696795850963664853876436146589697780
5615116170265832982572062247581228699008215519250167269735884545838
5999656344228794333644714858171757490873865697771366690049408940692
2493528000051421328419889088415801946798421419771945002396828340668
0559685837599052944776341647608549740601057335523144912187076479111
7163264805900863454277529353451903438095626197793323394681672500803
2273174886222196545911065690590313082975607416447039203354179165427
2871073654934371013291871676859601449767490340056018006581075890044
4599974988952563184663248215398499956395305185768715843331286448526
6029913770724121244218805751205948415195111444570803144889419737422
3395106243597524098039402109243432846937367130727192974904221607387
7810999565336610808254649338784038134744981896119915103550782519140
2669575443275949387502532202452301881100295157758210930286727008231
8786479568606724120447507264253031765620576468763169101413780680562
4694953195153708342332772192550142402826258921876707726717839316319
5515858627006504871732728853814925125220418914185291820389029378114
7221015578616822657207182966969108833261887396195671582655789118120
0075496450015630946271719230662934485999456350640924095373150676646
1421752757631097420434543739526294090715829303777603039740855267406
1559009204229457653063496022599276138466650947295387871093455237723
3723172541616479150333860115999774541290492207019012243080645180739
7519275562399434012124666653452695684367125869601002312956302928993
2786564866747321323455330986513332652856366151537189341234334425706
2374783204280963286317680076319294640628357733894492935445321648128
7916474744857447807861913616328089625520109509455972959621156639431
0885254036832011151782980631632861879106491313867632050854119556648
6696171199789781487469413343213010043979508621712270242007339943857
5749042303547552636270864238613788200589914122694559677553010631086
1316682276690008147778695578315874207093704649766441878696140024638
02960922451450730