

Hand-in problems 1 for Digital Arithmetic – TSTE18

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The solutions to the hand-in problems should be submitted at most one week after the corresponding seminar to result in prioritized corrections.

These problems should be solved on an **individual** basis. Each student has a consecutive number assigned during the first seminar (or through email contact with the examiner) and should solve the problems using the corresponding data.

Note that the problems should be solved **“by hand”**. Hence, you will need to provide some evidence that you actually solved the problem and not just ran some software for it.

Some of the conversions will lead to repeating or at least long solutions. Therefore, about ten digits is enough to convert.

On each sheet of paper write name, personal id number, and student-id, as well as the consecutive number assigned to you.

1 Compute the decimal value of the following integers

Note that $A = 10, B = 11, \dots$

Student no.	Number 1	Number 2	Number 3	Number 4	Number 5
1	$(1100001111)_2$	$(1001102)_3$	$(11034)_5$	$(303)_8$	$(42B)_{13}$
2	$(1000000101)_2$	$(101210)_3$	$(1224)_5$	$(1511)_8$	$(16B)_{13}$
3	$(11110111)_2$	$(221220)_3$	$(12110)_5$	$(1065)_8$	$(444)_{13}$
4	$(11101110)_2$	$(1022111)_3$	$(4322)_5$	$(1310)_8$	$(A3)_{13}$
5	$(1100111100)_2$	$(1001200)_3$	$(1313)_5$	$(1075)_8$	$(243)_{13}$
6	$(1001010000)_2$	$(122000)_3$	$(3344)_5$	$(407)_8$	$(1C5)_{13}$
7	$(1110110)_2$	$(1021111)_3$	$(10223)_5$	$(1653)_8$	$(160)_{13}$
8	$(1110100001)_2$	$(1010012)_3$	$(4440)_5$	$(760)_8$	$(1C7)_{13}$
9	$(1100001001)_2$	$(102100)_3$	$(1113)_5$	$(1427)_8$	$(422)_{13}$
10	$(1011101000)_2$	$(221010)_3$	$(3402)_5$	$(704)_8$	$(4C3)_{13}$
11	$(110000010)_2$	$(1010212)_3$	$(11220)_5$	$(1543)_8$	$(339)_{13}$
12	$(1010100000)_2$	$(1022102)_3$	$(4000)_5$	$(232)_8$	$(529)_{13}$
13	$(1010011100)_2$	$(120120)_3$	$(12442)_5$	$(456)_8$	$(40B)_{13}$
14	$(1010000100)_2$	$(121122)_3$	$(1403)_5$	$(173)_8$	$(2AB)_{13}$
15	$(100001010)_2$	$(1000220)_3$	$(3213)_5$	$(1531)_8$	$(467)_{13}$
16	$(1001100110)_2$	$(100121)_3$	$(12322)_5$	$(523)_8$	$(569)_{13}$
17	$(100101101)_2$	$(121011)_3$	$(1204)_5$	$(1244)_8$	$(173)_{13}$
18	$(10001101)_2$	$(1000211)_3$	$(3123)_5$	$(1267)_8$	$(283)_{13}$
19	$(1010011001)_2$	$(11102)_3$	$(12140)_5$	$(1465)_8$	$(474)_{13}$
20	$(1101000000)_2$	$(121111)_3$	$(10111)_5$	$(1152)_8$	$(355)_{13}$

2 Convert to specified radix the following decimal numbers

Student no.	Radix-2	Radix-7	Radix-8	Radix-11	Radix-16
1	905	164	318	148	498
2	112	907	277	184	377
3	510	192	996	399	368
4	156	368	142	555	785
5	668	181	173	800	915
6	580	198	843	404	365
7	772	109	144	701	643
8	573	757	737	803	359
9	723	601	457	155	802
10	404	647	767	194	215
11	595	537	901	819	761
12	146	166	180	819	949
13	715	219	750	199	206
14	677	396	688	774	625
15	766	311	761	974	880
16	178	430	432	717	638
17	810	431	285	178	795
18	285	449	597	306	678
19	536	237	804	191	365
20	314	578	182	465	194

3 Compute the decimal value of the following fractions

Indicate if the sequence repeats, e.g., by ...

Student no.	Number 1	Number 2	Number 3	Number 4	Number 5
1	$(0.11001001)_2$	$(0.30212)_4$	$(0.2422)_5$	$(0.1606)_7$	$(0.4D2)_{14}$
2	$(0.111101001)_2$	$(0.23111)_4$	$(0.11112)_5$	$(0.1266)_7$	$(0.374)_{14}$
3	$(0.11000111)_2$	$(0.32230)_4$	$(0.2034)_5$	$(0.664)_7$	$(0.426)_{14}$
4	$(0.1000011011)_2$	$(0.30120)_4$	$(0.3311)_5$	$(0.1003)_7$	$(0.98)_{14}$
5	$(0.1011000010)_2$	$(0.13213)_4$	$(0.4012)_5$	$(0.1615)_7$	$(0.AD)_{14}$
6	$(0.110000000)_2$	$(0.30123)_4$	$(0.10402)_5$	$(0.423)_7$	$(0.117)_{14}$
7	$(0.10110111)_2$	$(0.1223)_4$	$(0.3411)_5$	$(0.2004)_7$	$(0.3B9)_{14}$
8	$(0.1001000010)_2$	$(0.3012)_4$	$(0.10134)_5$	$(0.424)_7$	$(0.11B)_{14}$
9	$(0.10111101)_2$	$(0.3210)_4$	$(0.2001)_5$	$(0.544)_7$	$(0.1D8)_{14}$
10	$(0.110000001)_2$	$(0.10220)_4$	$(0.2301)_5$	$(0.2431)_7$	$(0.3A5)_{14}$
11	$(0.1001011000)_2$	$(0.10022)_4$	$(0.2131)_5$	$(0.332)_7$	$(0.49C)_{14}$
12	$(0.1011100000)_2$	$(0.21122)_4$	$(0.3012)_5$	$(0.505)_7$	$(0.352)_{14}$
13	$(0.1111011101)_2$	$(0.3331)_4$	$(0.2312)_5$	$(0.1222)_7$	$(0.BD)_{14}$
14	$(0.1011001100)_2$	$(0.13032)_4$	$(0.12420)_5$	$(0.1230)_7$	$(0.351)_{14}$
15	$(0.11101111)_2$	$(0.12323)_4$	$(0.1440)_5$	$(0.2165)_7$	$(0.472)_{14}$
16	$(0.110100000)_2$	$(0.23031)_4$	$(0.2430)_5$	$(0.1454)_7$	$(0.449)_{14}$
17	$(0.1001111110)_2$	$(0.12102)_4$	$(0.2434)_5$	$(0.1323)_7$	$(0.264)_{14}$
18	$(0.110101000)_2$	$(0.21122)_4$	$(0.11033)_5$	$(0.1256)_7$	$(0.26A)_{14}$
19	$(0.11010100)_2$	$(0.1322)_4$	$(0.2421)_5$	$(0.1061)_7$	$(0.372)_{14}$
20	$(0.1111000001)_2$	$(0.32232)_4$	$(0.4022)_5$	$(0.631)_7$	$(0.404)_{14}$

4 Convert to specified radix the following decimal fractions

Indicate if the sequence repeats, e.g., by ...

Student no.	Radix-2	Radix-3	Radix-5	Radix-9	Radix-12
1	0.597	0.667	0.129	0.653	0.426
2	0.145	0.541	0.273	0.211	0.285
3	0.232	0.270	0.138	0.672	0.354
4	0.585	0.726	0.549	0.582	0.501
5	0.212	0.541	0.868	0.887	0.343
6	0.288	0.608	0.676	0.475	0.285
7	0.953	0.174	0.195	0.228	0.250
8	0.659	0.616	0.147	0.938	0.756
9	0.764	0.157	0.874	0.941	0.986
10	0.873	0.807	0.562	0.260	0.459
11	0.221	0.128	0.945	0.371	0.366
12	0.400	0.520	0.683	0.123	0.858
13	0.603	0.869	0.413	0.501	0.149
14	0.259	0.697	0.398	0.909	0.206
15	0.990	0.586	0.736	0.1000	0.359
16	0.473	0.518	0.788	0.836	0.190
17	0.260	0.424	0.151	0.570	0.402
18	0.258	0.288	0.915	0.708	0.522
19	0.921	0.194	0.771	0.763	0.606
20	0.266	0.637	0.370	0.221	0.291

5 Express the following values in sign-magnitude, one's complement, and two's complement binary representations

Student no.	Number 1	Number 2	Number 3	Number 4	Number 5	Number 6
1	464	-504	$\frac{429}{16}$	$\frac{-787}{16}$	$\frac{665}{1024}$	$\frac{-795}{1024}$
2	940	-975	$\frac{273}{16}$	$\frac{-225}{16}$	$\frac{727}{1024}$	$\frac{-184}{1024}$
3	573	-577	$\frac{875}{16}$	$\frac{-536}{16}$	$\frac{454}{1024}$	$\frac{-704}{1024}$
4	767	-568	$\frac{413}{16}$	$\frac{-235}{16}$	$\frac{627}{1024}$	$\frac{-336}{1024}$
5	140	-779	$\frac{319}{16}$	$\frac{-498}{16}$	$\frac{719}{1024}$	$\frac{-423}{1024}$
6	763	-455	$\frac{715}{16}$	$\frac{-734}{16}$	$\frac{498}{1024}$	$\frac{-118}{1024}$
7	398	-482	$\frac{343}{16}$	$\frac{-277}{16}$	$\frac{840}{1024}$	$\frac{-487}{1024}$
8	899	-452	$\frac{792}{16}$	$\frac{-457}{16}$	$\frac{828}{1024}$	$\frac{-780}{1024}$
9	440	-294	$\frac{811}{16}$	$\frac{-954}{16}$	$\frac{395}{1024}$	$\frac{-704}{1024}$
10	495	-850	$\frac{792}{16}$	$\frac{-251}{16}$	$\frac{876}{1024}$	$\frac{-991}{1024}$
11	563	-896	$\frac{629}{16}$	$\frac{-239}{16}$	$\frac{280}{1024}$	$\frac{-466}{1024}$
12	774	-843	$\frac{811}{16}$	$\frac{-387}{16}$	$\frac{581}{1024}$	$\frac{-181}{1024}$
13	201	-223	$\frac{711}{16}$	$\frac{-546}{16}$	$\frac{271}{1024}$	$\frac{-546}{1024}$
14	233	-149	$\frac{866}{16}$	$\frac{-605}{16}$	$\frac{937}{1024}$	$\frac{-727}{1024}$
15	625	-834	$\frac{891}{16}$	$\frac{-990}{16}$	$\frac{100}{1024}$	$\frac{-879}{1024}$
16	651	-991	$\frac{575}{16}$	$\frac{-532}{16}$	$\frac{821}{1024}$	$\frac{-305}{1024}$
17	548	-911	$\frac{617}{16}$	$\frac{-861}{16}$	$\frac{765}{1024}$	$\frac{-627}{1024}$
18	322	-700	$\frac{175}{16}$	$\frac{-663}{16}$	$\frac{695}{1024}$	$\frac{-757}{1024}$
19	902	-984	$\frac{792}{16}$	$\frac{-623}{16}$	$\frac{935}{1024}$	$\frac{-622}{1024}$
20	115	-209	$\frac{876}{16}$	$\frac{-536}{16}$	$\frac{860}{1024}$	$\frac{-288}{1024}$