

1a.

The pair with the greatest number of orthologs is rat and mouse (16674).

The pair with the least number of orthologs is yeast and alpaca (4).

2b.

Table

human rat		15206	
human mouse		15996	
human fly		3261	
human worm		2573	
human yeast		1176	
human alpaca		25	
human cow		15641	
human horse		15552	
human pig		15744	
human sheep		15601	
human cat		15500	
human dog		15616	
human guinea_pig			15084
human rabbit		14339	
human chicken		12083	
human duck		12028	
human turkey		11416	
rat mouse		16674	
rat fly	3132		
rat worm		2467	
rat yeast		1120	
rat alpaca		24	
rat cow	14988		
rat horse		14803	
rat pig	15037		
rat sheep		14910	
rat cat	14832		
rat dog	14862		
rat guinea_pig		14663	
rat rabbit		13837	
rat chicken		11602	
rat duck		11574	
rat turkey		10974	
mouse fly		3273	
mouse worm		2567	
mouse yeast		1169	
mouse alpaca		25	
mouse cow		15580	
mouse horse		15454	
mouse pig		15645	
mouse sheep		15527	
mouse cat		15383	
mouse dog		15474	
mouse guinea_pig			15349
mouse rabbit		14417	
mouse chicken		12100	
mouse duck		12044	
mouse turkey		11423	
fly worm		3263	
fly yeast		1269	
fly alpaca		10	
fly cow	3198		
fly horse		3228	
fly pig	3174		
fly sheep		3170	
fly cat	3170		
fly dog	3146		
fly guinea_pig		3227	
fly rabbit		2937	
fly chicken		2995	
fly duck		3022	
fly turkey		2855	
worm yeast		1212	

worm alpaca	8	
worm cow	2519	
worm horse	2558	
worm pig	2490	
worm sheep	2495	
worm cat	2513	
worm dog	2484	
worm guinea_pig	2537	
worm rabbit	2304	
worm chicken	2359	
worm duck	2384	
worm turkey	2268	
yeast alpaca	4	
yeast cow	1166	
yeast horse	1185	
yeast pig	1143	
yeast sheep	1139	
yeast cat	1141	
yeast dog	1133	
yeast guinea_pig		1163
yeast rabbit	1054	
yeast chicken	1091	
yeast duck	1096	
yeast turkey	1054	
alpaca cow	23	
alpaca horse	24	
alpaca pig	20	
alpaca sheep	22	
alpaca cat	22	
alpaca dog	25	
alpaca guinea_pig		25
alpaca rabbit	24	
alpaca chicken	19	
alpaca duck	8	
alpaca turkey	21	
cow horse	15429	
cow pig	15655	
cow sheep	16454	
cow cat	15381	
cow dog	15435	
cow guinea_pig	14835	
cow rabbit	14202	
cow chicken	11849	
cow duck	11828	
cow turkey	11242	
horse pig	15387	
horse sheep	15354	
horse cat	15288	
horse dog	15300	
horse guinea_pig		14713
horse rabbit	14191	
horse chicken	11772	
horse duck	11824	
horse turkey	11218	
pig sheep	15644	
pig cat	15703	
pig dog	15492	
pig guinea_pig	14858	
pig rabbit	14200	
pig chicken	11862	
pig duck	11835	
pig turkey	11202	
sheep cat	15316	

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sheep dog          15404
sheep guinea_pig   14741
sheep rabbit       14181
sheep chicken      11773
sheep duck         11763
sheep turkey       11154
cat dog            15490
cat guinea_pig     14733
cat rabbit         14072
cat chicken        11694
cat duck           11694
cat turkey         11089
dog guinea_pig     14714
dog rabbit         14145
dog chicken        11747
dog duck           11743
dog turkey         11150
guinea_pig rabbit  13706
guinea_pig chicken 11710
guinea_pig duck    11671
guinea_pig turkey  11091
rabbit chicken     10961
rabbit duck        11013
rabbit turkey      10423
chicken duck       12343
chicken turkey     11798
duck turkey        11690

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Script:

./awkscript

```

arr=("human" "rat" "mouse" "fly" "worm" "yeast" "alpaca" "cow" "horse" "pig" "sheep" "cat" "dog" "guinea_pig" "rabbit" "
chicken" "duck" "turkey")

for i in {0..17}
do
    first=${arr[$i]}

    next=$((i+1))
    for j in $(seq $next 17)
    do
        second=${arr[$j]}
        printf "%s\t%s\t" "${arr[$i]}" "${arr[$j]}"
        eval ". /awkcel '({first}!=\"_\" && {second}!=\"_\"){{print human}}' testfiles/orthologs.tsv | wc -l"
    done
done

```

2a.

./awkcel 'date=="2011-07-05"{print "amzn:", AMZN "msft", MSFT}' historical.2011.tsv

amzn: 209.49 msft: 26.02

amzn: 213.19 msft: 26.03

2b ./awkcel '{print AMZN-last, "date=" date}{last=AMZN}' historical.2011.tsv | sort -n  
The worst day was October 26th, 2011. It dropped 29.07 dollars.

2c. CSX suffered the worst single day loss on June 16th, 2011, dropping 66.7%.

Script:

./awkscript2 | sort -n

```
$ cat awkscript2
arr=("AA" "AAPL" "ABT" "ABX" "AMGN" "AMZN" "BAC" "BF_B" "BHI" "BIDU" "BMY" "BWL_A" "CMCSA" "COP" "CSCO" "CVS" "CVX"
"DD" "DIA" "DIS" "EEM" "EFA" "EMC" "EWZ" "F" "FAS" "FXI" "GDX" "GE" "GLD" "GOOG" "GS" "HAL" "HD" "HPQ" "HUB_B" "
IBM" "INTC" "ITUB" "IVV" "IWM" "KFT" "KO" "KV_A" "LOW" "LVS" "MA" "MCD" "MDY" "MET" "MJV_CL" "MOS" "MRK" "MS" "MSF
T" "NEM" "NFLX" "NOV" "ORCL" "OXY" "PBR" "PCLN" "PEP" "PFE" "PG" "PM" "POT" "QCOM" "QLD" "RIG" "SBUX" "SINA" "SLB"
"SPY" "TLT" "TNA" "USB" "UTX" "V" "VALE" "VIA_B" "VWO" "VXX" "VZ" "WFC" "WMT" "YHOO" "FCHI" "FTAS" "FTLC" "FTMC"
"FTSE" "GDAXHI" "GDAXI" "GSPC" "GSPTSE" "HSI" "IBEX" "MDAXI" "N225" "OEX" "RUT" "SBF120" "SBF250" "SBF80" "SDAXI"
"TECDAX" "TYX" "AXP" "C" "CAT" "CHK" "CRM" "DE" "DELL" "DOW" "EBAY" "EMR" "ESRX" "FAZ" "FCX" "GLW" "GM" "IYR" "JNJ
" "JPM" "LLV" "MDT" "MO" "MRO" "NKE" "NWSA" "RIMM" "SDS" "SNDK" "SSO" "T" "TGT" "TXN" "TZA" "UNH" "USO" "WAG" "WYN
N" "XLB" "XLE" "XLF" "XLI" "XOM" "APA" "BRCM" "CMI" "DVN" "EOG" "HON" "MON" "NLY" "PNC" "SU" "TEVA" "TWX" "UNP" "U
PS" "XRT" "ANR" "APC" "BHP" "CLF" "COF" "DTV" "GG" "SLW" "VLO" "VOD" "WMB" "XLU" "ALTR" "AMAT" "BTU" "M" "MMM" "MU
" "TRV" "XLK" "FDX" "HES" "KSS" "NTAP" "NVDA" "OIH" "PRU" "TOT" "XLY" "YUM" "BAX" "CBS" "WFT" "XLV" "XOP" "qqq" "C
MG" "CSX" "FFIV" "RIO" "SPG" "XME" "ACN" "EXC" "JNPR" "QID" "WLP" "AFL" "CTL" "CTSH" "EWY" "JCI" "LMT" "SWN" "COV"
"EWJ" "WLT" "XLP" "EP" "ERX" "MGM" "COH" "CAM" "CELG" "COST" "KMB" "NOK" "NSC" "SMH" "VMW" "DUK" "TYC" "ADM" "DHR
" "FSLR" "ITW" "MHS" "FITB" "EWM" "STT" "TMO" "BBD" "IWO" "MRVL" "ADBE" "CCL" "SO")

for i in {0..250}
do
    first=${arr[$i]}
    eval ". /awkcel '(last!=0 && last!=\"_\" && ${first}!=\"_\") {print ${first}/last, \"date=\" date}{last=${fir
st}}' testfiles/historical.2011.tsv | sort -n | head -1 | tr '\n' ' '
    echo $first
done
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Galaxy Spirals

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