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#!/bin/sh
#Question:
#Moore's law is the observation that the number of transistors in a dense
# integrated circuit(IC) doubles approximately every two years. A transistor is a
# semiconductor device used to build electronic circuits. An IC is a set of
# electronic circuits on one small flat piece of semiconductor material.

# Example: Assume if in year 2000, 1 transistor was present on IC, then in year
# 2002 : 2 transistors , 2004 : 4 transistors, 2006 : 8 transistors, 2008 : 16
# transistors and in year 2010 : 32 transistors would be present on IC
# respectively.

# Write a Shell script that:
# a) Reads from end user using suitable messages:
#     i. Year, YP ( say year past/ previous, a year where number of transistors on
#        IC are known ) and
#     ii. Number of transistor on IC during that year, TIC ( both integers )
#     iii. ( As compared to YP , a) Year in future, YF ( integer )
# b) Checks if YP , TIC and YF are logically correct
# c) Predicts number of transistors that would be present on IC in year YF
# d) Prints with suitable message, future year YF and predicted number of
#    transistors
#    on IC for that year.

# Always write assumptions made, either as comment or as description
# and keep the rough work, do not erase it out

# a) Reads from end user using suitable messages:
#     i. Year, YP ( say year past/ previous, a year where number of transistors on
#        IC are known ) and
echo "Year in past, yp = "
read yp

#     ii. Number of transistor on IC during that year, TIC ( both integers )
echo "Number of transistor on IC during $yp = "
read tic

#     iii. ( As compared to YP , a) Year in future, YF ( integer )
echo "Year in future where number of transistors to be predicted, yf = "
read yf

# b) Checks if YP , TIC and YF are logically correct:
echo "Entered values of YP , TIC and YF are logically "
# Check if they are non negative, all are greater than zero, and yf > yp
if [ $yp -gt 0 -a $tic -gt 0 -a $yf -gt 0 -a $yf -gt $yp ]
then
    echo "correct"
else
    echo "incorrect"
    exit 1
fi

# c) Predicts number of transistors that would be present on IC in year YF

#     number of transistors in a dense IC doubles approximately every two years

#     Say you start in year 2000 with 5 transistors , then
#     in 2002 its 10 transistors, 5 * 2 , doubles
#     in 2004 its 20 transistors, 10 * 2 , double of earlier
#     in 2006 its 40 transistors, 20 * 2 , double of earlier .
#     in 2008 its 80 transistors, 40 * 2 , double of earlier .

#     Hence you are multiplying tic by 2 , 4 , 8 , 16 , 32 ..
#     If the difference in years is 2 , 4 , 6 , 8 , 10 respectively

#     If you divide the difference of years by 2: ( yf - yp ) / 2
#           1 , 2 , 3 , 4 , 5
#     and 2 to the power of this result gives us the required multiple
#     2 ^ ( ( yf - yp ) / 2 ) = 2 , 4 , 8 , 16 , 32

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#   Therefor  $t_{ic} * ( 2 ^ { ( y_f - y_p ) / 2 } )$  are transistors in future

#   Its shell script, use $ to get value of variable ,
#   use calculator bc , to find power of
#   do not forget to escape * and use of expr to evaluate
#   And enclose in backquote `` to imply its commands and not just string

multiple=`echo "2 ^ ( ( $yf - $yp ) / 2 )" | bc`
ticInYf=`expr $tic \* $multiple`

# d) Prints with suitable message, future year YF and predicted number of
#   transistors on IC for that year.

echo "If during $yp , transistors on IC were $tic,"
echo " then during $yf , number of transistors will be $ticInYf "

# or using while loop , double tic every two years, from yp to yf

ticInYf=$tic    #initialize

while [ $yp -lt $yf ]      # from yp to yf
do
    ticInYf=`expr $ticInYf + $ticInYf`  # or $ticInYf \* 2
                                         # doubles
    yp=`expr $yp + 2`      # increment yp by two instead of 1
                           # that is every two years
done

echo "During $yf , number of transistors will be $ticInYf "

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