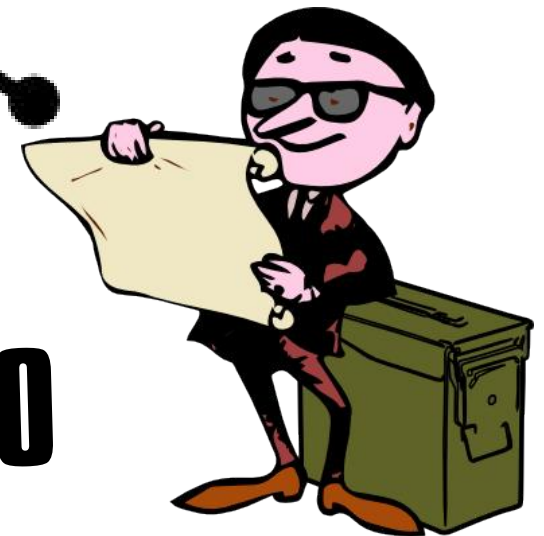
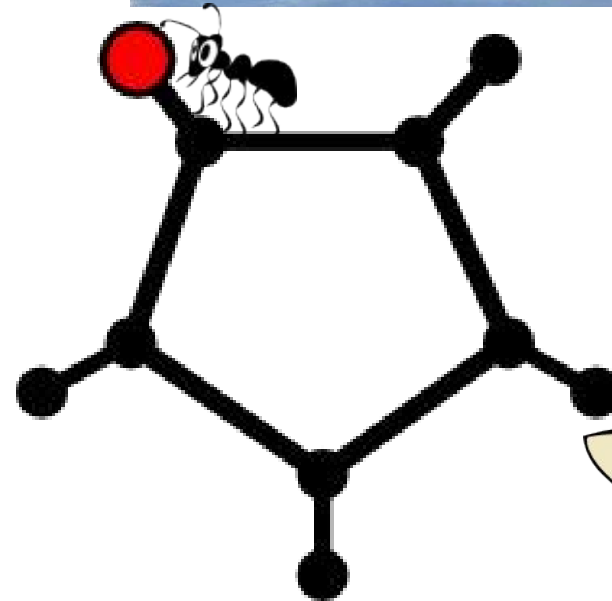
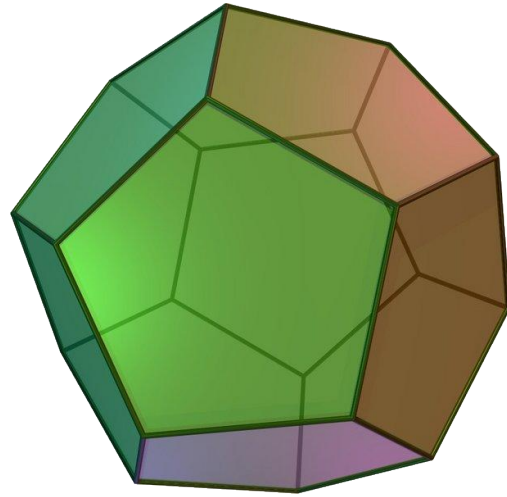
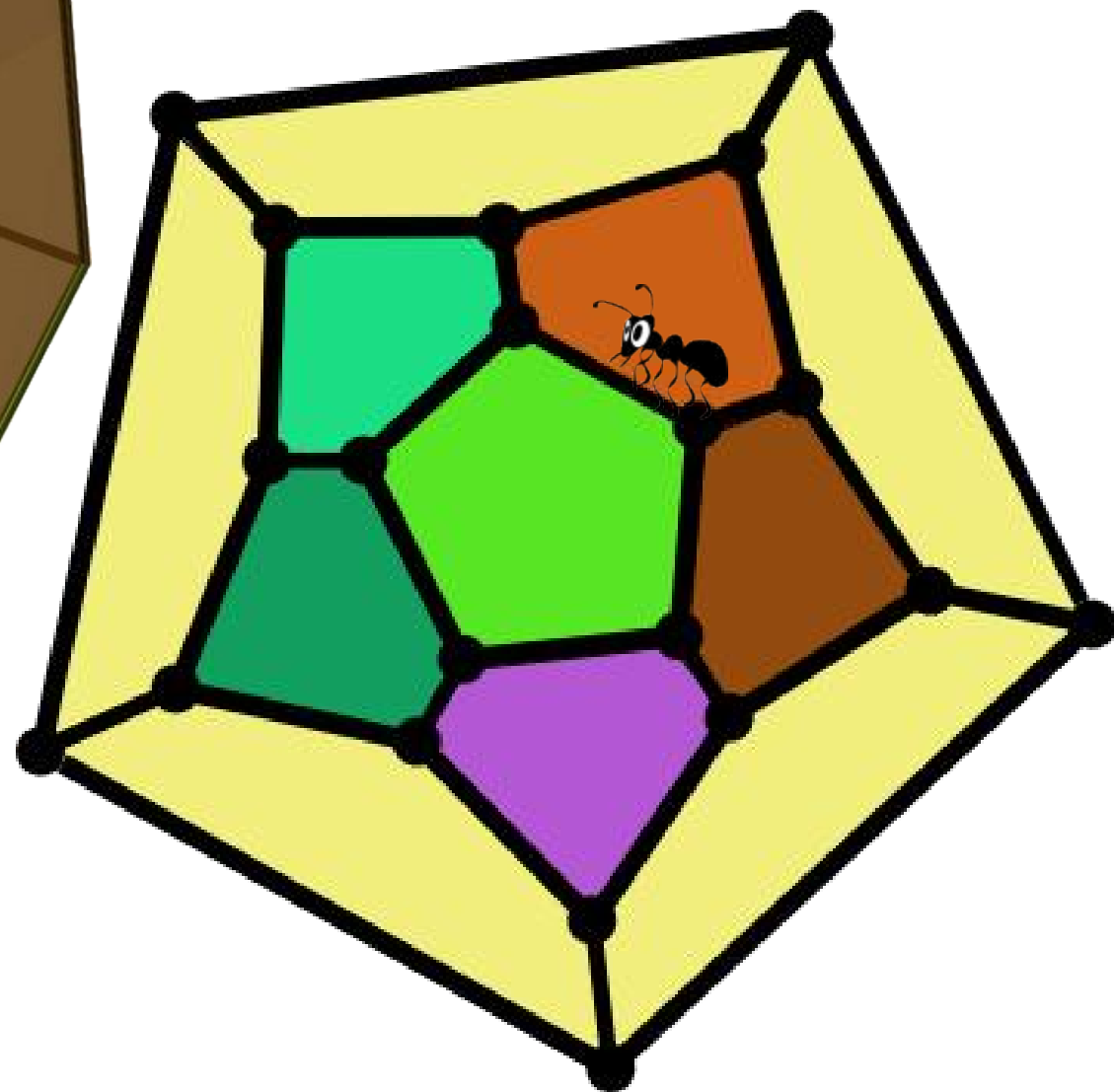
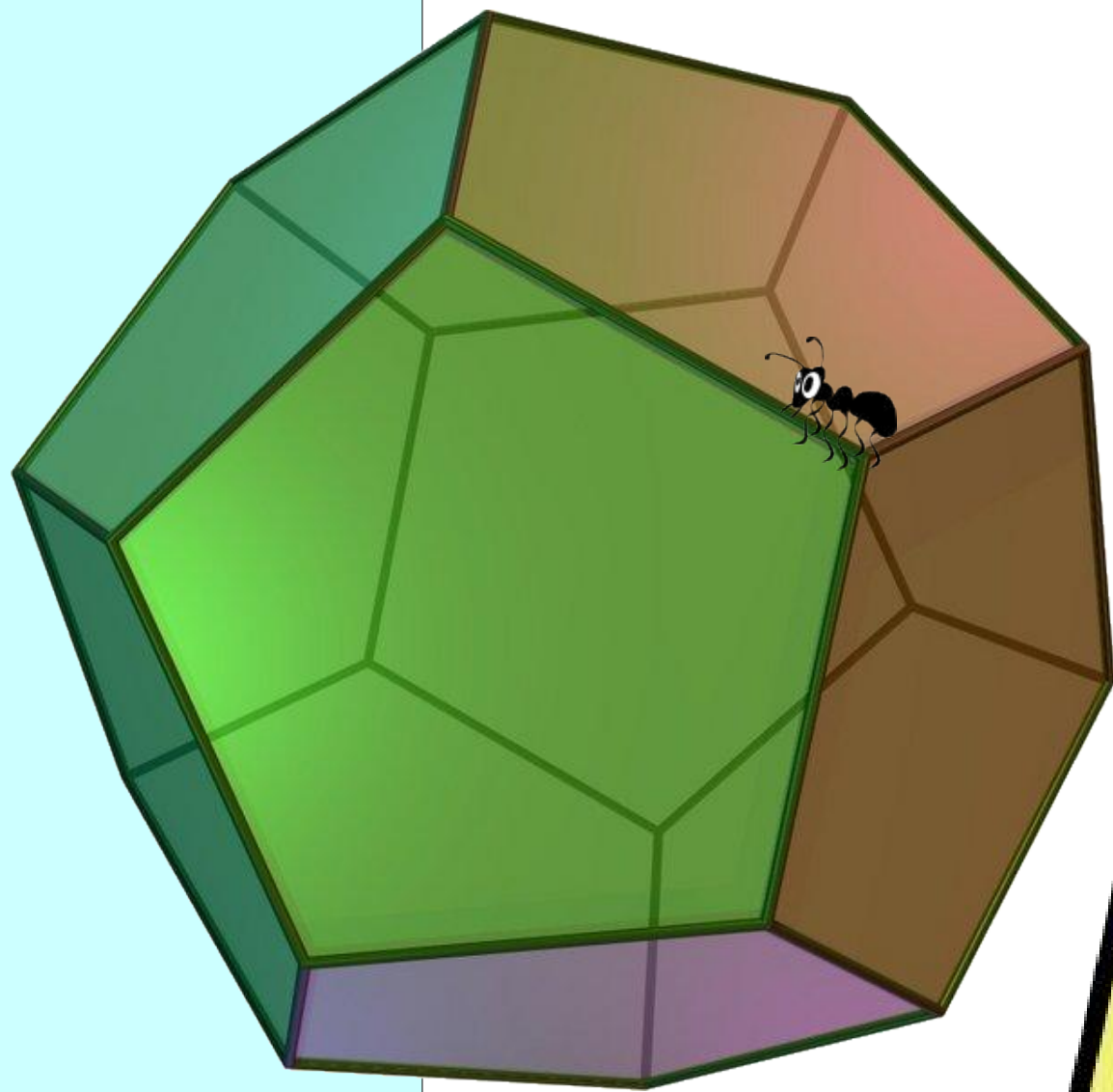


# THE MATHS OF THE TOUR AROUND THE WORLD



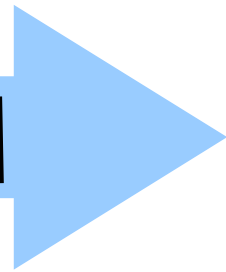
**MARCO COLOMBO**  
THE UNIVERSITY OF EDINBURGH

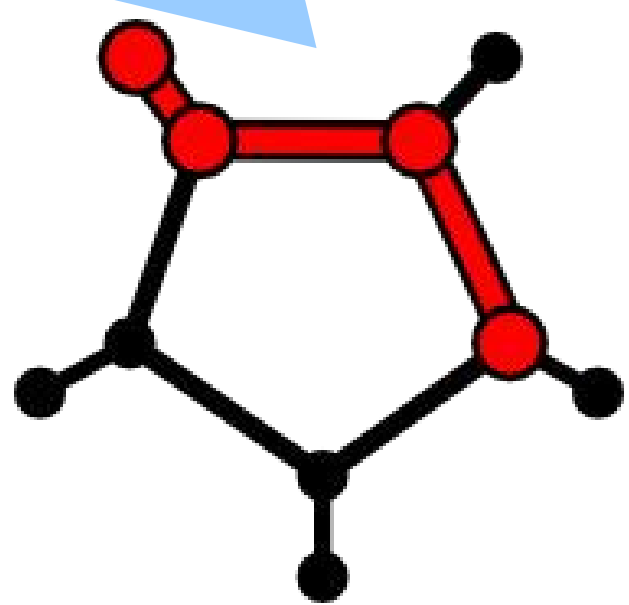
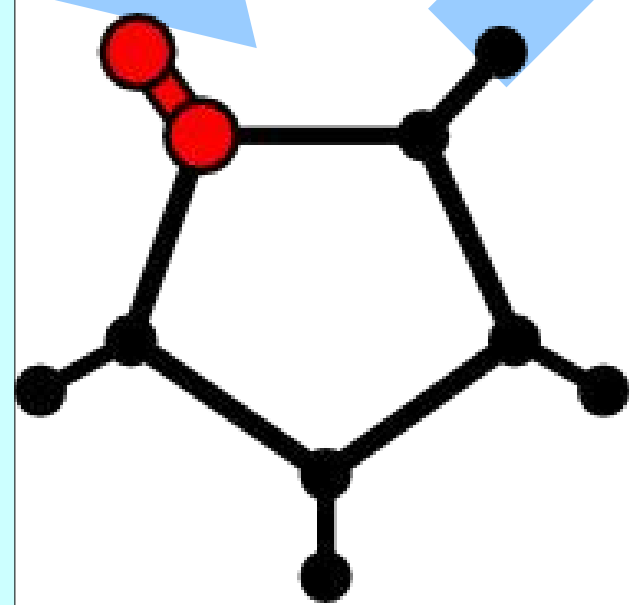
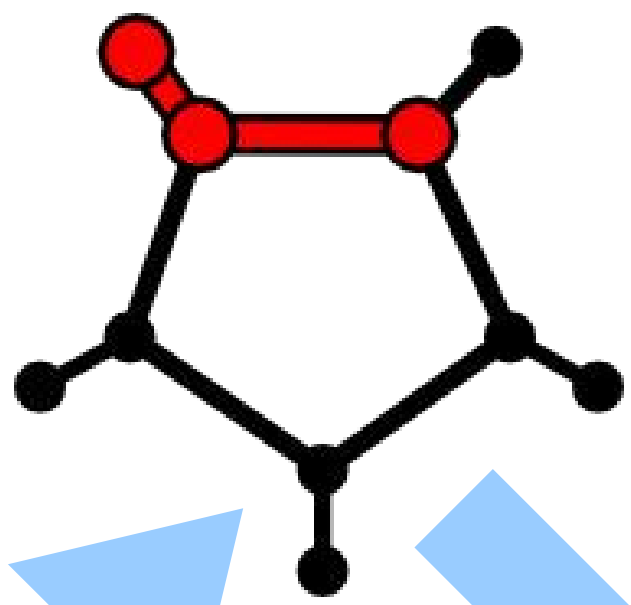
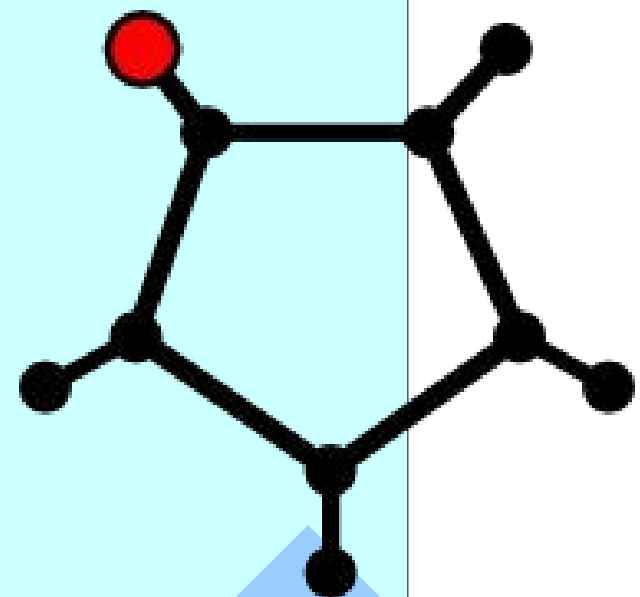






**WILLIAM ROWAN HAMILTON**

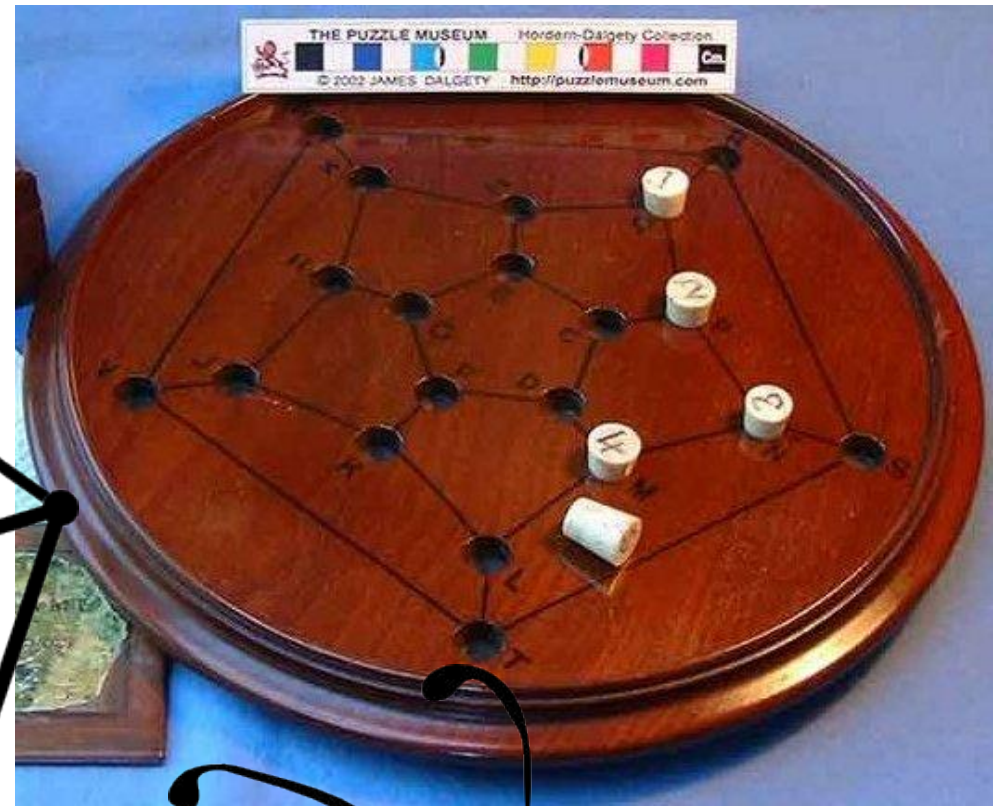
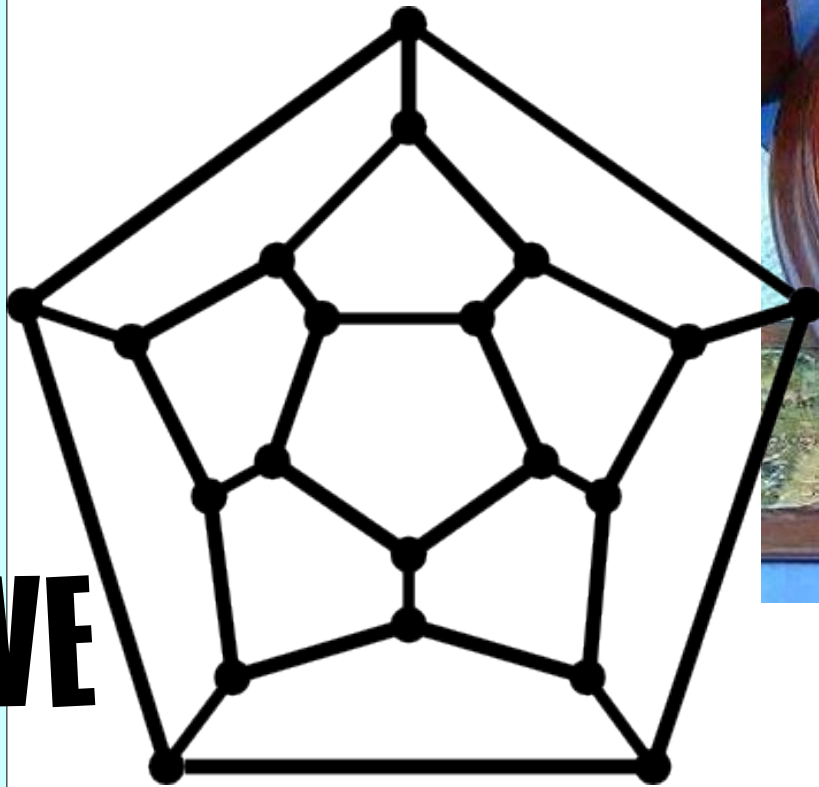




**ONLY  
ONE  
RULE!**



**NOW  
IT'S UP  
TO YOU  
TO SOLVE  
THIS  
PUZZLE!**



**WHICH WAY  
SHOULD  
I GO?**

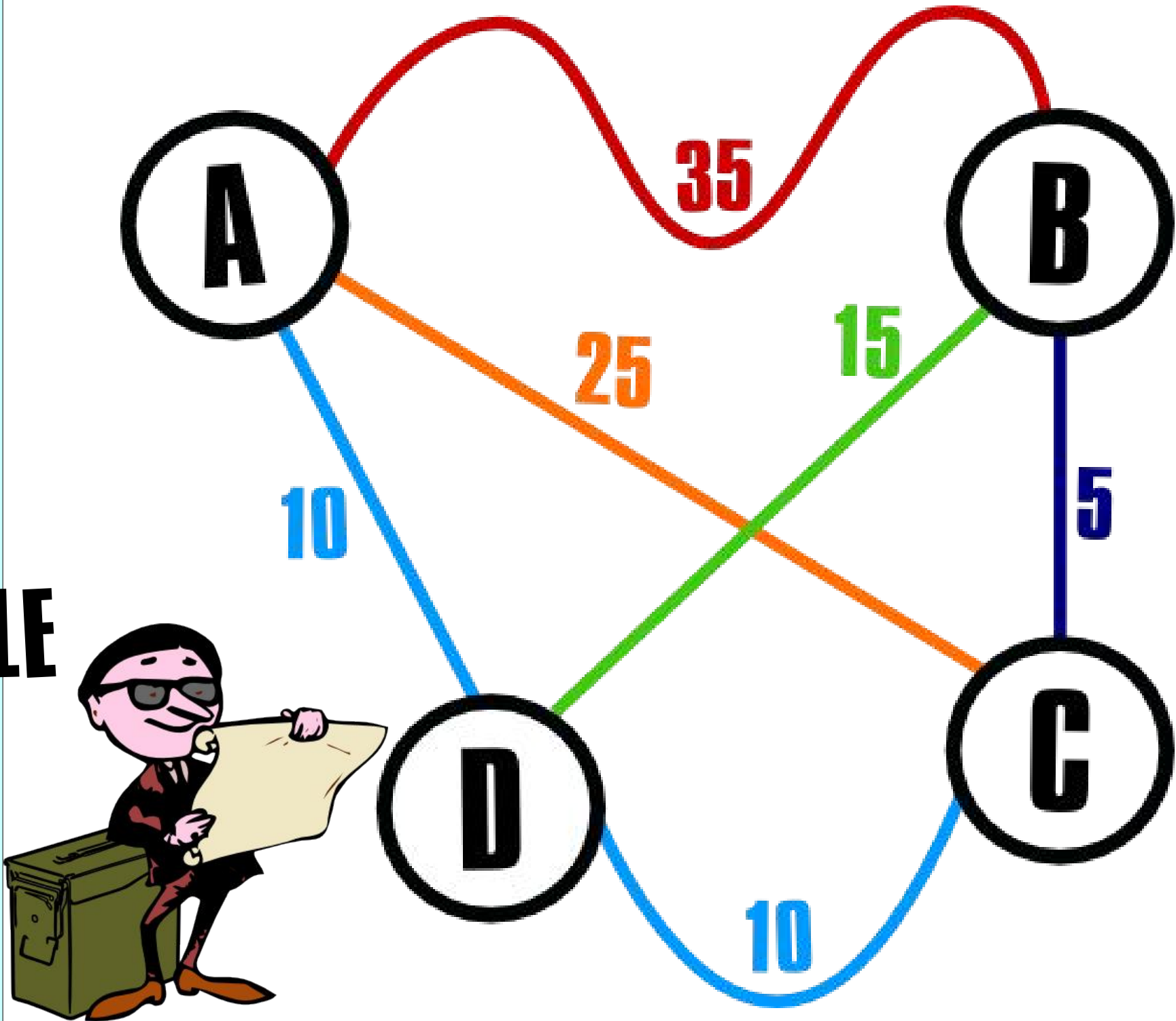




**LET'S  
HELP A  
TRAVELLING  
SALESMAN**



**AN  
EASY  
EXAMPLE**



**LET'S  
COUNT  
THE  
DISTANCES**

**A – B – C – D – A:**

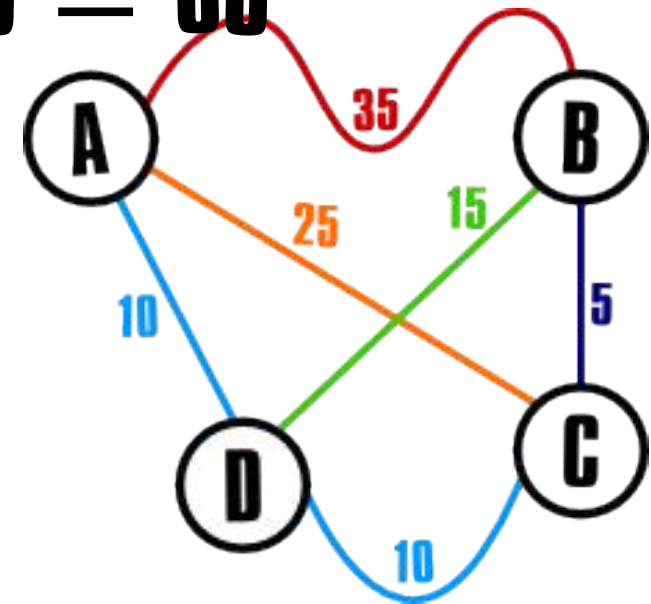
$$35 + 5 + 10 + 10 = 60$$

**A – C – B – D – A:**

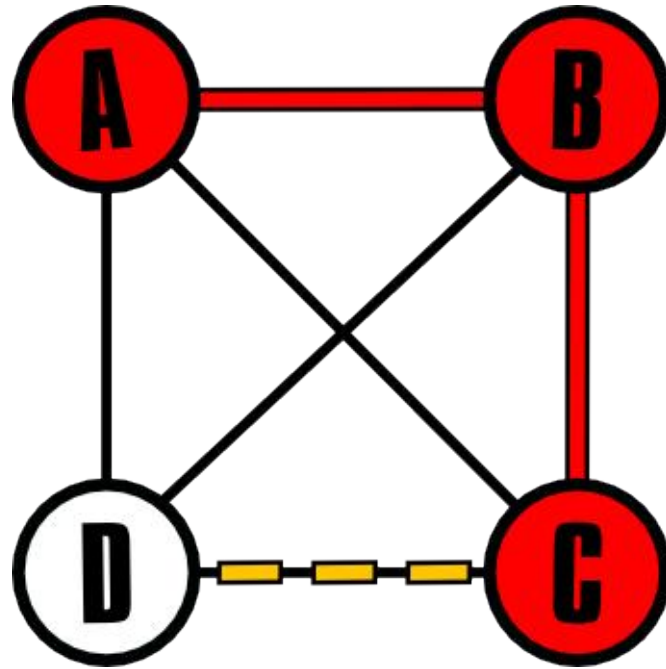
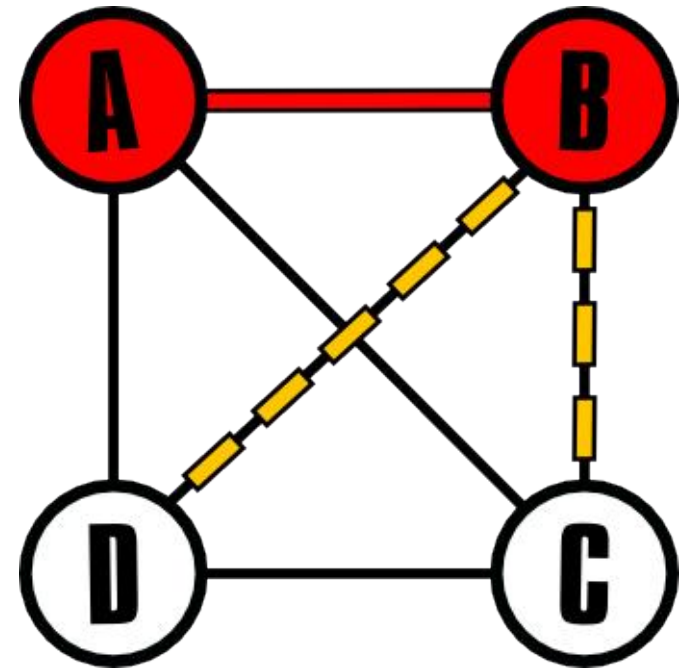
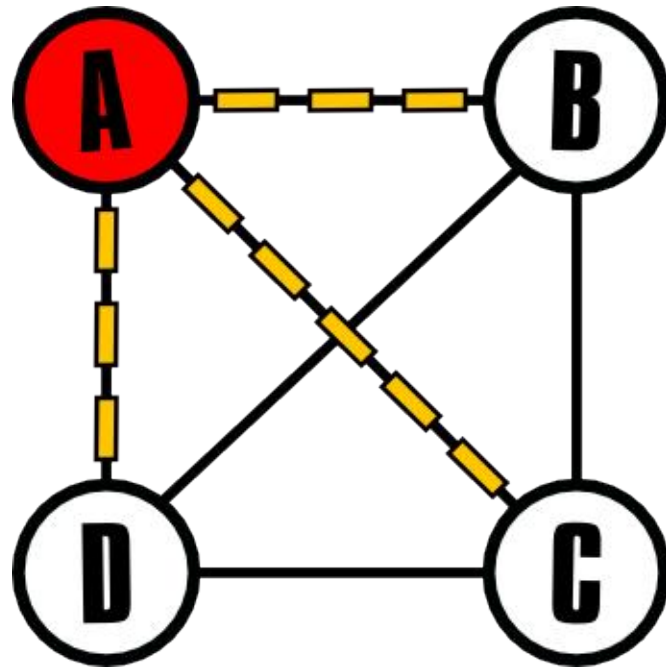
$$25 + 5 + 15 + 10 = 55$$

**A – C – D – B – A:**

$$25 + 10 + 15 + 35 = 85$$



**HOW  
MANY  
ROUTES  
ARE  
THERE?**



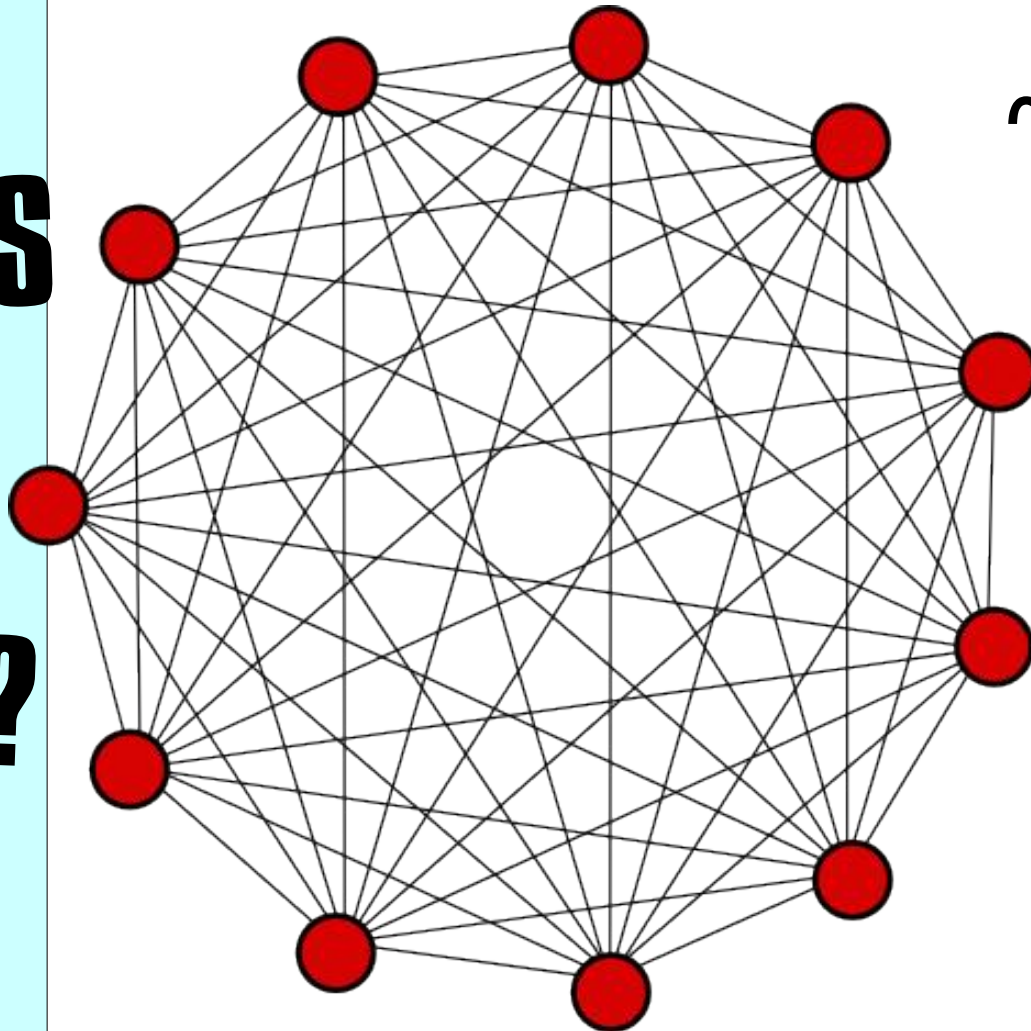
**$3 \times 2 \times 1 = 6$   
POSSIBILITIES**



**FOR 11 CITIES:**

$$10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 10!$$

**~ 3.6 MILLION  
POSSIBILITIES!**



**HOW  
MANY  
ROUTES  
ARE  
THERE?**



**NUMBER OF STARS IN THE UNIVERSE:**

**$\sim 70,000,000,000,000,000,000,000$**



**HOW**

**LARGE**

**ARE**

**THESE**

**NUMBERS?**

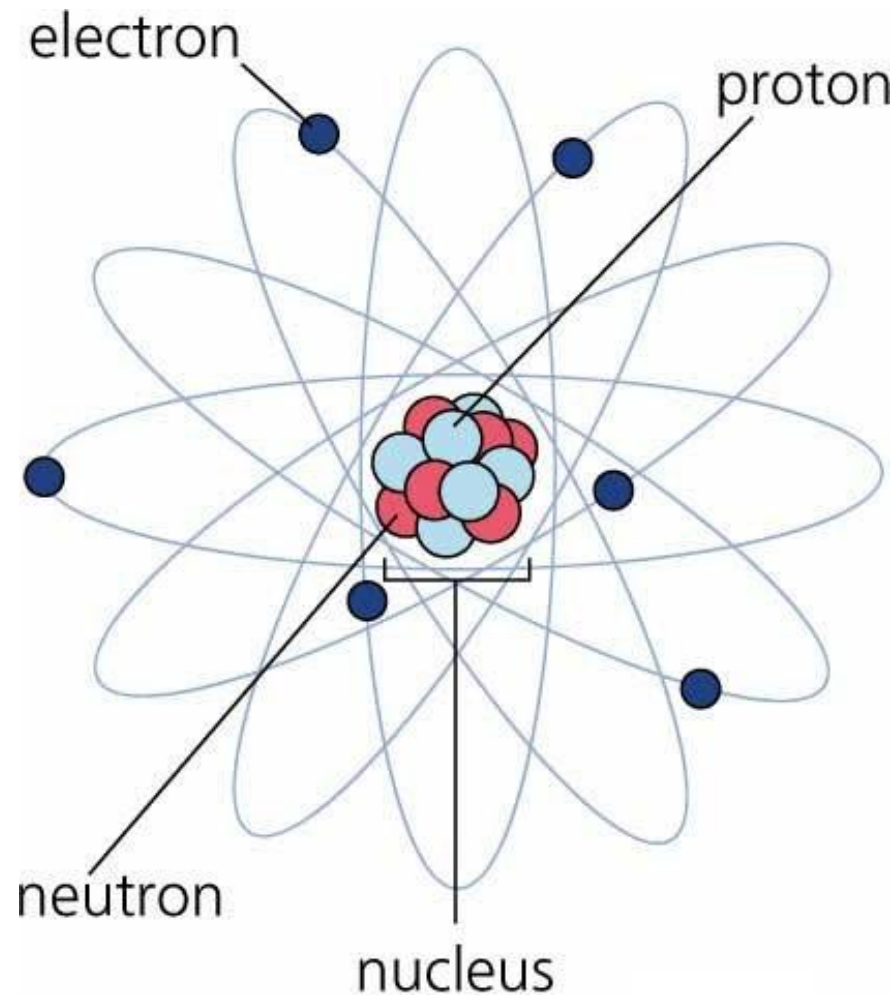
**25! IS A LARGER NUMBER!**



**NUMBER OF ATOM IN THE UNIVERSE:**

**~10 FOLLOWED BY 80 ZEROS**

**HOW  
LARGE  
ARE  
THESE  
NUMBERS?**



**60! IS A LARGER NUMBER!**



**THE  
LARGEST  
PROBLEM  
SOLVED:  
24,978  
CITIES**

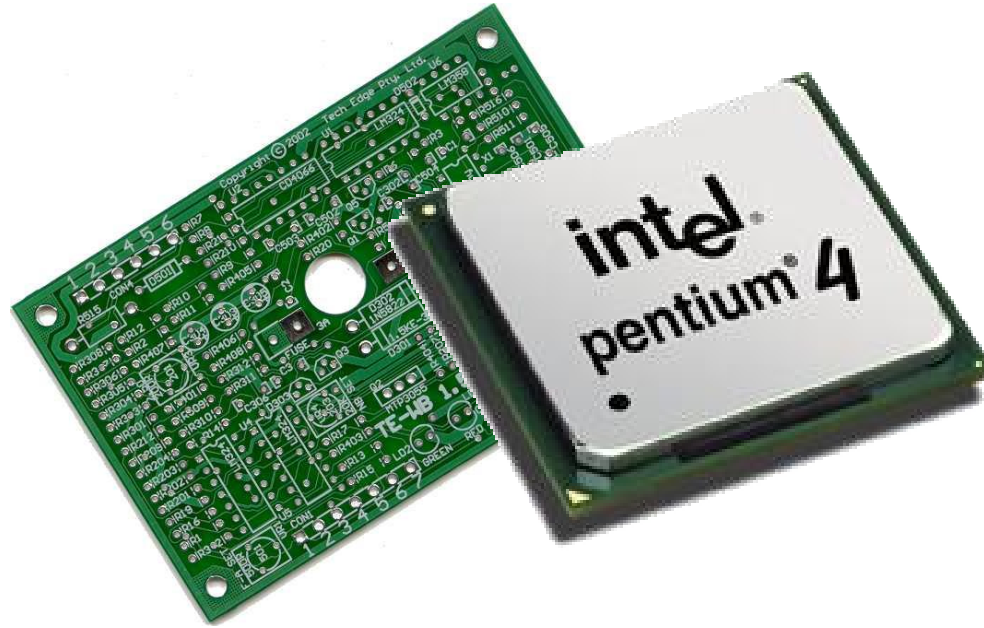
**72,500 KM**



**84.8 SOLVED BY 96 PCs  
COMPUTER YEARS!**



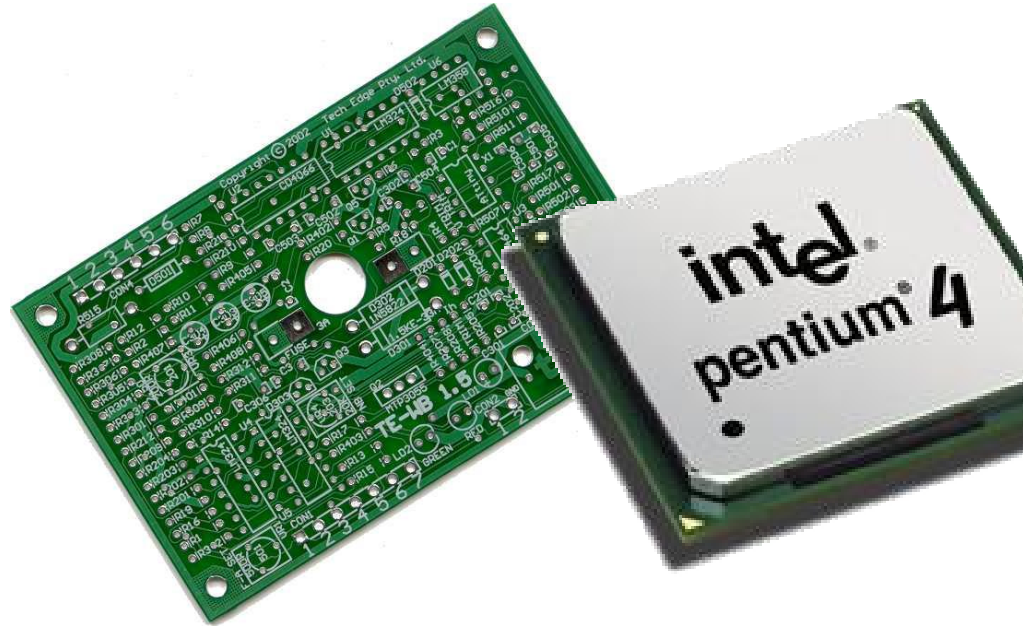
# PRINTED CIRCUITS



**REAL  
LIFE  
CASES**



# COIN COLLECTING

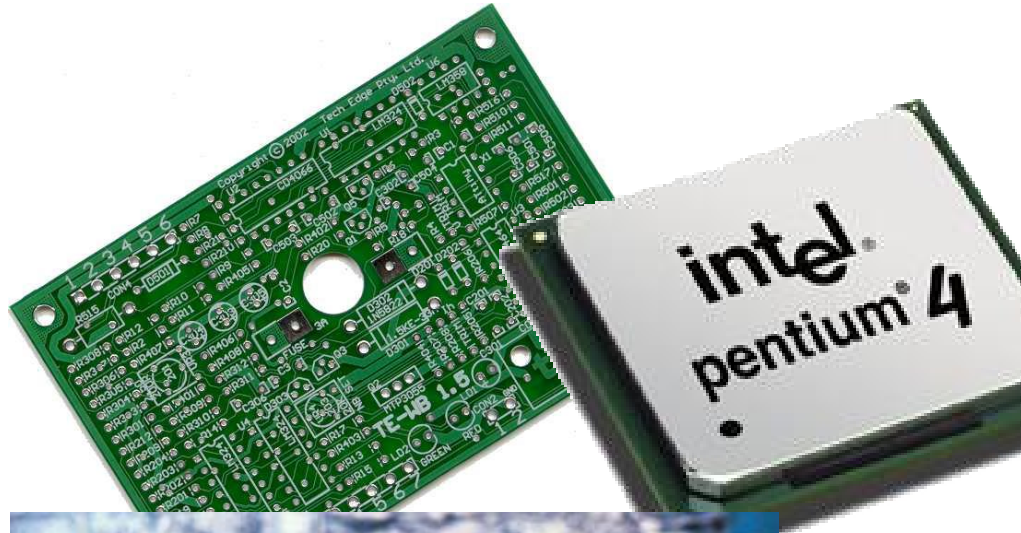


**REAL  
LIFE  
CASES**



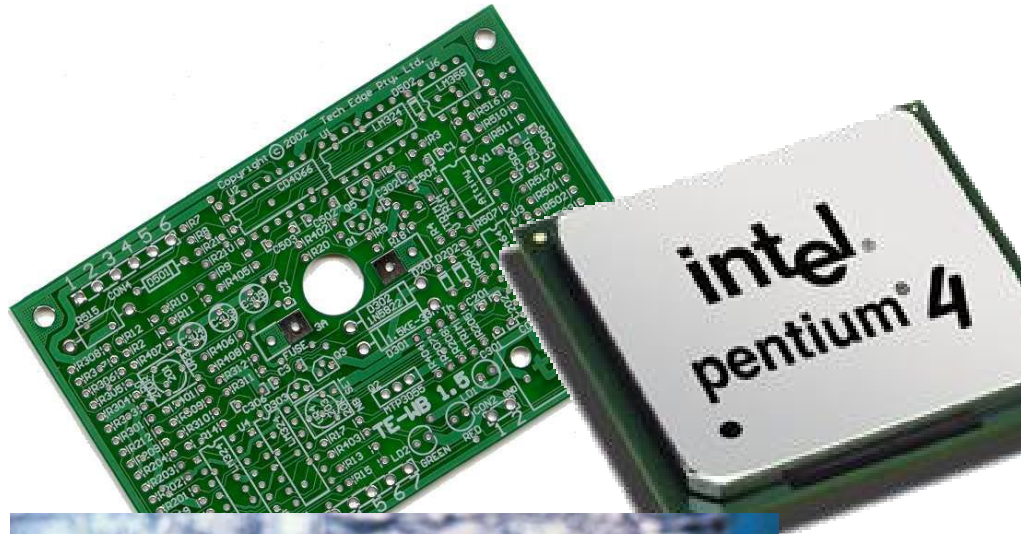
# MAIL COLLECTING

REAL  
LIFE  
CASES

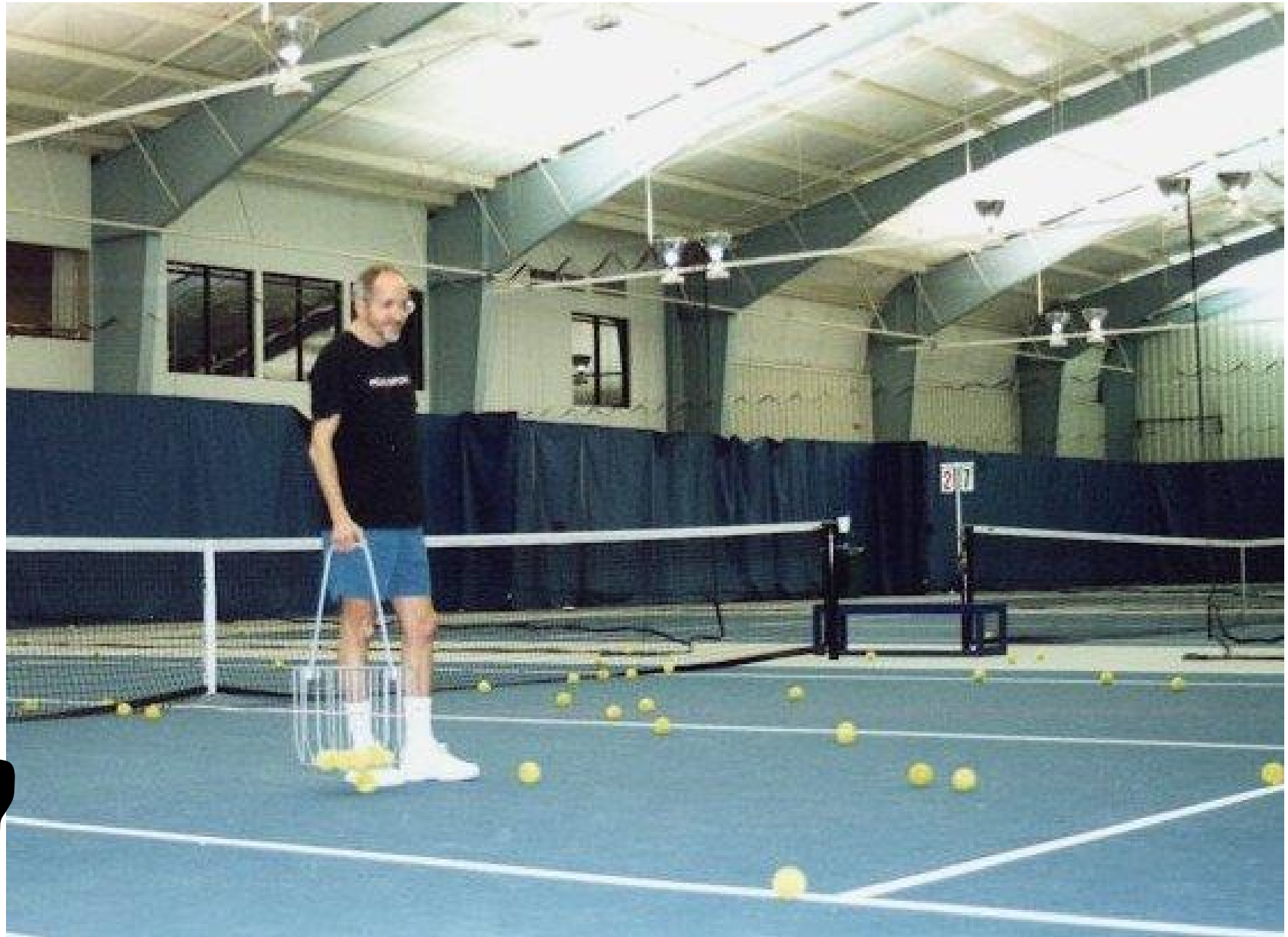


# DNA STUDIES

**REAL  
LIFE  
CASES**



**DID  
THIS  
EVER  
HAPPEN  
TO YOU?**



**CAN  
YOU  
SOLVE  
THIS  
PROBLEM?**

**THERE'S A  
\$1,000,000 PRIZE  
WAITING FOR YOU!**

