



ROCHESTER  
BRIDGE TRUST

# The Nutcracker and the 4 Realms

*Inventions, forces & innovation!*



## Exploring Engineering Film Festival at home

At this time of year, we usually look forward to welcoming audiences to a cinema venue, for a family film festival screening of "The Nutcracker & the 4 Realms". This film has been selected for its link to engineering, physics and invention. The themes of the laws of physics and of inventions set the context for the central characters, Clara and her godfather, who is a skilled engineer and inventor. Clara shows significant promise as a problem solver and engineer in her own right, meaning this is a great opportunity to demonstrate the variety and inclusivity of engineering for all.

As we can't invite you to join us at the cinema this year, we have produced this series of activities that can accompany watching the film at home. Ideal for learners of all ages, there is something for everyone, to carry on the fun and excitement, even after the film has finished.

Grab some popcorn and enjoy the film!



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# Nutcracker wordsearch

D H M P N U M D I Y V R M I C  
B R M A X O A J I K E O N S I  
A A O Z C N I C G E Z N E A N  
L P P S C H K T N P O K J M U  
L Z O E S M I I N V G A P T T  
E L R K U E G N A E Z N X S C  
T L R W B N L T E U V K F I R  
K R F S E L I M A G X N Y R A  
G S A F P O J C E R G F I H C  
T T Y C N C R M R Y A A I C K  
M U L P R A G U S Q E L K E E  
N A I I S O L D I E R R C Z R  
S M L A E R C M M L I K D A M  
L I R B J V N T X V X Q E M I  
Y H H F Y M I M B Q Q O B H D

BALLET  
CHRISTMAS  
CLARA  
DANCER  
DROSSELMEYER  
ENGINEER  
INNOVATION

INVENTION  
MACHINE  
MAZE  
NUTCRACKER  
REALMS  
SOLDIER  
SUGARPLUM



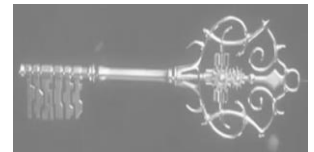
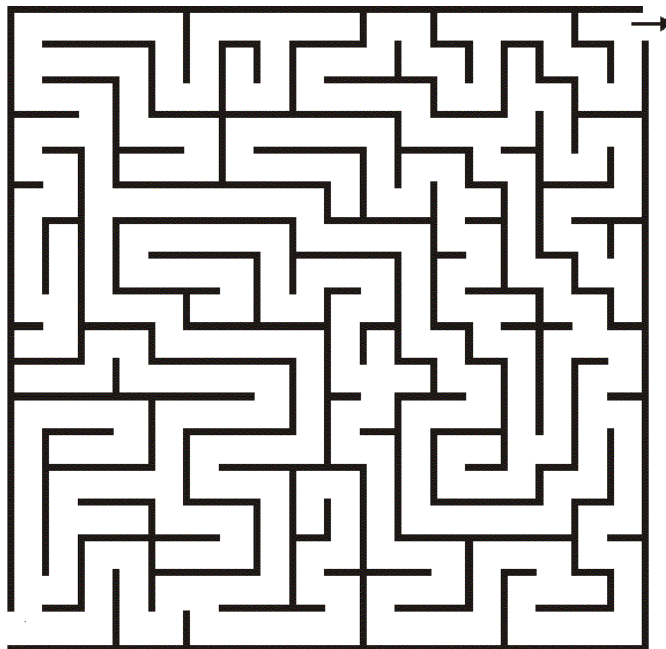


## Find your way through the maze

In the film, all the children at Drosselmeyer's party have to follow a ribbon to find a gift. Help Clara to make her way through the maze to find her way to the key



**Start**



**End**

### **More maze fun.....**

You could design your own maze like the one above. Challenge your friends to find their way across the maze.

### **Build a Lego marble maze**

You could even have a go at building a Lego® maze for a marble to move through: <https://littlebinsforlittlehands.com/lego-marble-run/>

### **Build a cardboard marble maze**

<https://www.youtube.com/watch?v=CX0FxDvdx4>

(Let's Go Live – Mini Makers)





## Inventing a toy

Clara and Drosselmeyer are engineers and inventors. The average 10 year old child in the UK is said to own many toys, but only plays with 12 in any one day. If you were a toy designer working for Santa or a large toy store, how would you design a toy that everyone would want to play with?



### Who is it for?

You must explain who your toy is suitable for – what are their ages? What might they be interested in?

### Describe

You should choose suitable materials for the parts and explain why you have chosen them. Include reference to their properties



### Identify

The features of your toy and explain how it works.

### Highlight

Label any interesting features or decorations it would have.

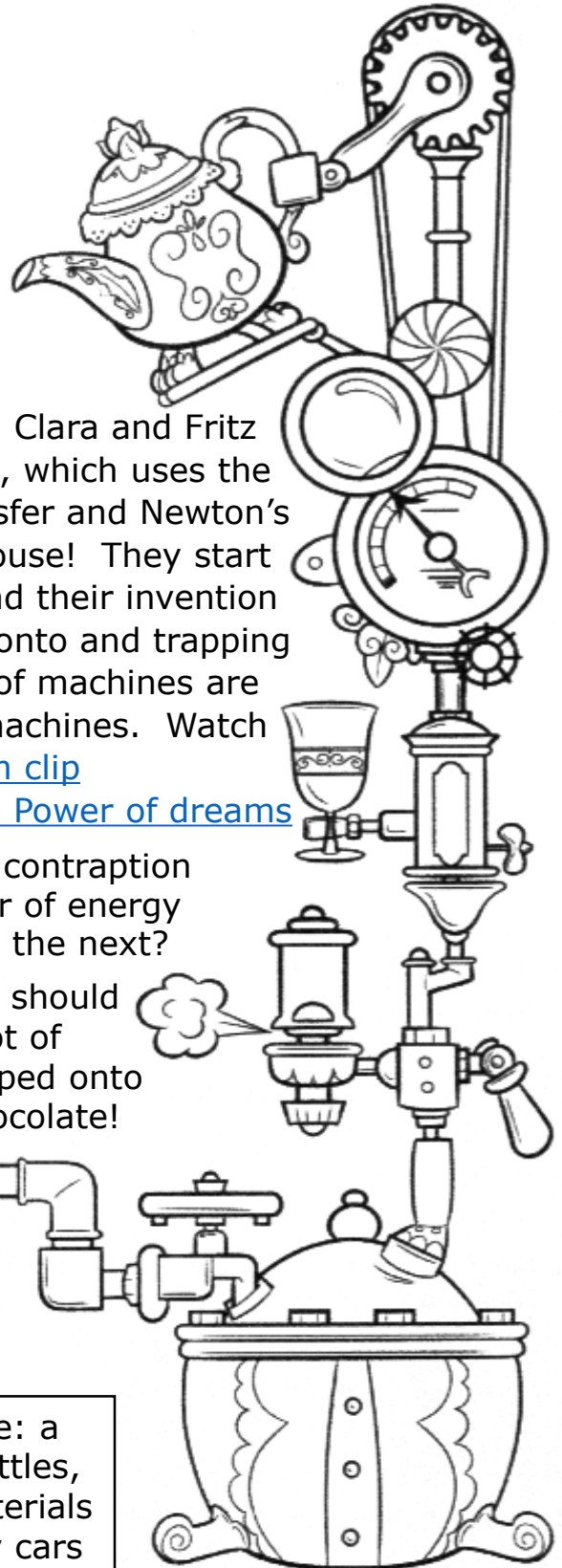
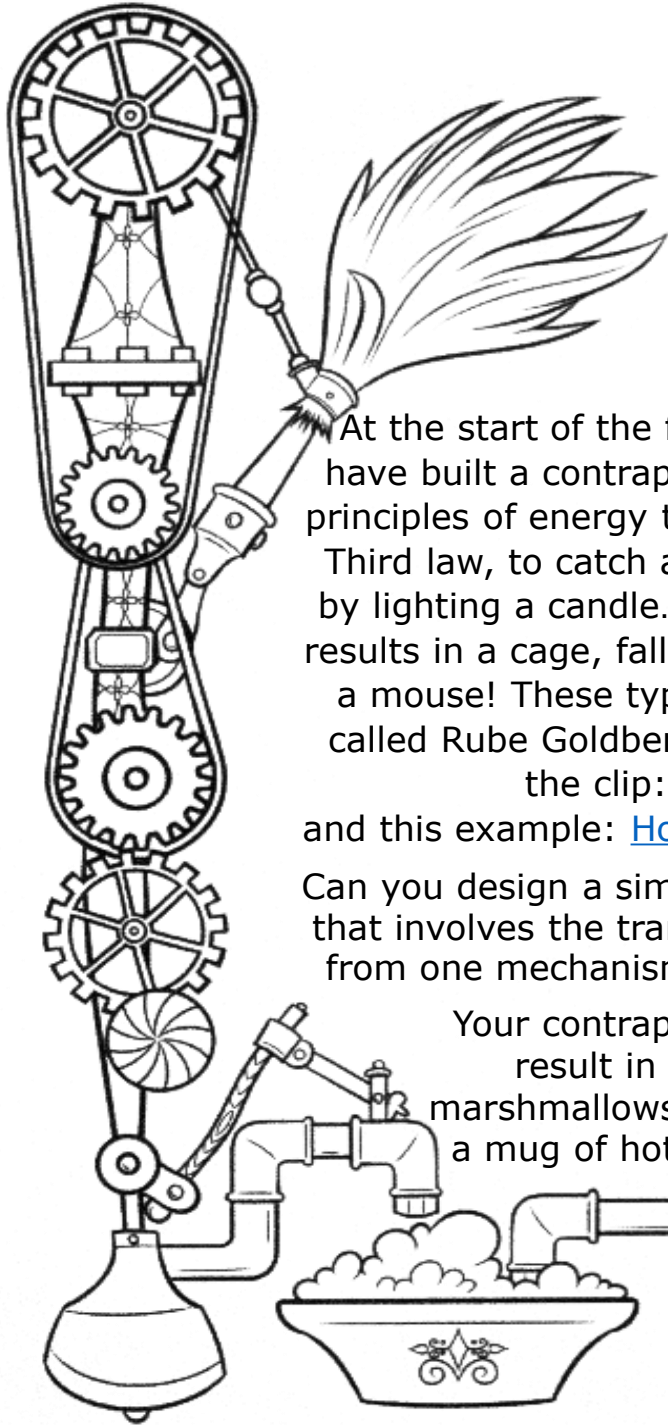


**Draw and label a diagram of your toy and include the information above**





# Inventing a machine



At the start of the film, Clara and Fritz have built a contraption, which uses the principles of energy transfer and Newton's Third law, to catch a mouse! They start by lighting a candle... and their invention results in a cage, falling onto and trapping a mouse! These types of machines are called Rube Goldberg machines. Watch the clip: [Film clip](#)

and this example: [Honda Power of dreams](#)

Can you design a similar contraption that involves the transfer of energy from one mechanism to the next?

Your contraption should result in a pot of marshmallows tipped onto a mug of hot chocolate!

To complete this challenge you could use: a selection of recycling materials (plastic bottles, boxes, cardboard, foil), plus additional materials such as marbles, balls, string, springs, toy cars

