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Hidden Figures

Maths, space travel and physics!



Exploring Engineering Film Festival – to you!

As part of our family film festival, we usually look forward to welcoming audiences to a cinema venue, for a screening of “Hidden Figures”. This film has been selected for its link to engineering, physics and the pioneering contribution made by the female computers at NASA.

The film is set within NASA’s Langley Research facility in West Virginia, where the incredibly skilled women work as “human computers” carrying out complex mathematical calculations for the engineering and space research taking place at NASA. Against the backdrop of segregation and prejudice against women, the film is set during the era of the space race when space flight and landing on the moon were being fought for. This sets a remarkable context to tell the story of the central characters, Katherine, a mathematician who works in the space task team; Mary, who works in the heat shield engineering team and Dorothy, a mathematician and programmer who became the first African-American supervisor at NASA.

By watching this film, we pay tribute to women of STEM everywhere, to inspire the young people of today to become the engineers, scientists and mathematicians of tomorrow.



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Maths, space travel and physics!

Information for teachers/group leaders

We have compiled this selection of activities to support the delivery of this film within the learning contexts set out by the National Curriculum. The themes of the film allow learners to appreciate the principles of engineering, maths, physics and innovation that have enabled us to achieve great things within the field of space travel and aerospace engineering. The film serves as a tool to inspire the next generation of engineers, from a more diverse pool of talent, and to raise the aspirations of girls to embrace the opportunities that exist within the fields of science, maths and engineering.

We have compiled the following activities linked to the themes of the film:

- Word searches (KS1 and KS2/3)
- Storytelling video and differentiated writing task (KS1/2)
- Biography task using books & websites (differentiated by age)
- Design a launch tower engineering challenge (KS2/3)
- Rocket themed maths and science fun (all KS)

Topics that can be linked to this film & these resources in KS2 include: forces/forces & magnets, the use of levers, cogs & gears in simple machines, understanding materials and their uses, the design process, evaluation of designs & application of technical knowledge to designing/making. It is also an excellent tool for starting activities and conversations around discrimination and stereotypes for PSHE.

If you would like to host an STEM film festival event in your school and/or would like any further information about organising supporting activities please contact us: education@rbt.org.uk

We recommend this film as part of celebrations of International Women in Engineering Day (held annually on 23rd June), however the Hidden Figures film festival can be embedded as part of any appropriate learning theme/topic.





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Hidden Figures wordsearch

KS1/2

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



Astronaut
Engineer
Land
Launch
Maths
Moon

NASA
Planet
Rocket
Space
Star
Sun

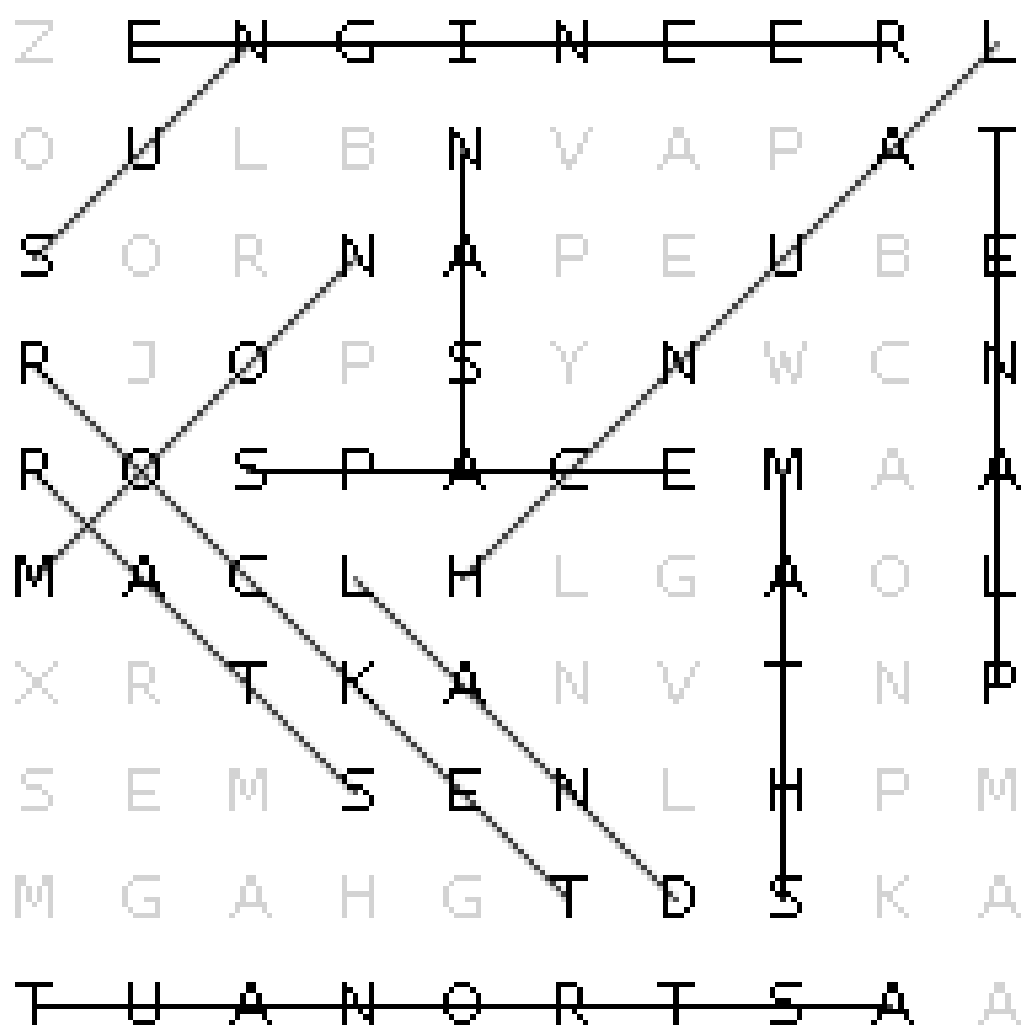


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KS1/2 solution





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Hidden Figures wordsearch

KS2/3

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



Apollo
Astronaut
Calculation
Computer
Discrimination
Engineer
Katherine

Mathematics
Mercury
Moon
Orbit
Physics
Space
Stereotype



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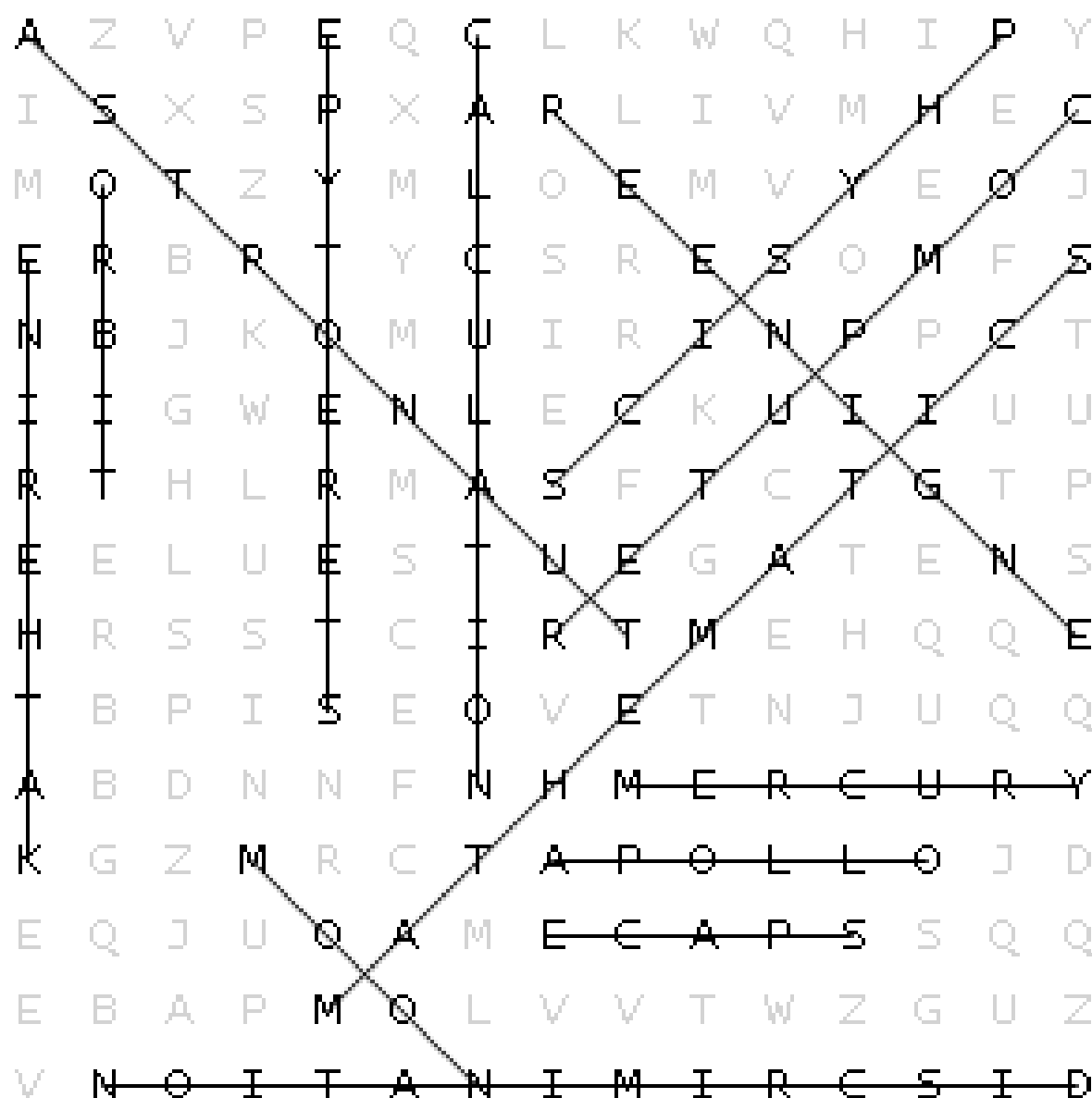
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Hidden Figures wordsearch

KS2/3 solution



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Hidden Figures story telling

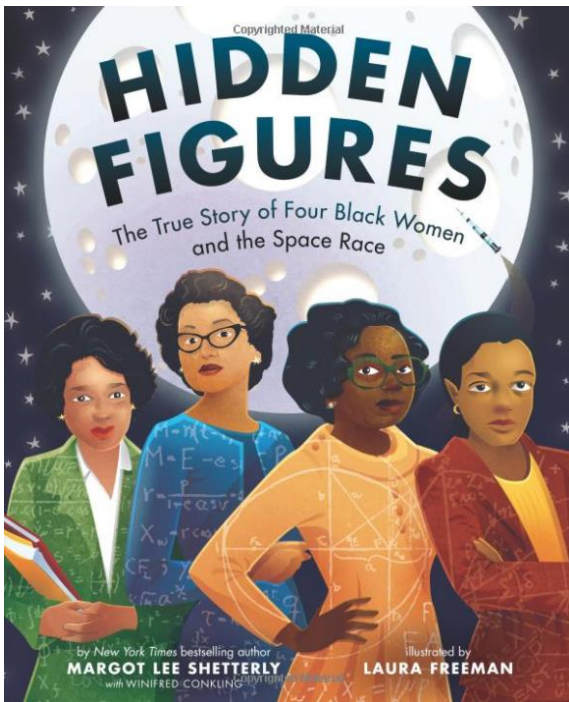
Read the story of "Hidden Figures"

Author: Margot Lee Shetterly

ISBN: 9780062742469

Published by Harper Collins (2018)

Age range: 5-8 (ATOS 5.8)



You can hear the story being read here:

<https://www.youtube.com/watch?v=H1V8NcvSy9Q&t=39s>

Tell the story

Use the words in the box below can you tell the story of Katharine Johnson and the other characters in the film?

Human Computers
Maths
Calculation
Engineer
Astronaut

Segregation
NASA
Space
Orbit

Learners could produce a newspaper article, a cartoon strip or a book review to recount the story.



Katherine Johnson Biography

Find out more about Katherine Johnson

Using a range of resources, including books, websites and the film, find out more about Katherine Johnson. Learners can use what they find out to create a biography.

Websites:

[https://www.commonlit.org/texts/who-is-katherine-johnson#:~:text=Katherine%20Johnson%20\(1918%2D2020\),working%20on%20their%20space%20missions](https://www.commonlit.org/texts/who-is-katherine-johnson#:~:text=Katherine%20Johnson%20(1918%2D2020),working%20on%20their%20space%20missions)

<https://www.nasa.gov/content/katherine-johnson-biography>

BBC iPlayer CBBC "Our black history heroes" episode:

<https://www.bbc.co.uk/iplayer/episode/m000wfkj/our-black-history-heroes-series-1-6-katherine-johnson> (2 mins)

Books:

Counting on Katherine: How Katherine Johnson Put Astronauts on the Moon – Helaine Becker (Age 5-7) [Link](#)

The Extraordinary Life of Katherine Johnson – Devika Jina (Age 7-12) [Link](#)

Katherine Johnson (You Should Meet) – Thea Feldman (Age 6-8) [Link](#)

Reaching for the Moon: The Autobiography of NASA Mathematician Katherine Johnson – Katherine Johnson (Age 10+) [Link](#)



Photo credit: NASA

Learners could present their biography as a class display, a newspaper article or a fact file.





Design a launch tower challenge

KS2/3



Think like a Civil Engineer

When a rocket is being assembled on the launch pad, a service structure (tower) has to be built to allow the engineers to work on the rocket, prior to launch. Have a look at this [video](#) where you can see the tower at the side of the rocket that is going to be launched. The tower moves away at launch to allow the rocket to take off.

Your challenge!

Design and build a model tower, that the engineers from NASA can use to assemble and work on the rocket. Your tower should be freestanding (not attached to anything else), must be able to support the engineers' mass at the top and be at least 1m tall, so that the engineers can reach the top of the rocket! You may fold or cut your paper however you wish! There must be a platform at the top, on which engineers can stand.

You will need:

- 12 x sheets A4 paper
- Sellotape & scissors
- A 500g mass (500ml water bottle) to represent the mass of the engineers
- A tape measure to ensure your tower is 1m tall

This activity can be adapted by giving each group greater/fewer pieces of paper to make the challenge easier/harder. It can also be adapted for younger learners. Learners can be challenged to build the tallest tower they can using construction toys such as Lego® or recycling materials.





Rocket fun

NASA's Jet Propulsion Laboratory has an excellent selection of activities for learners of all ages and linked to the theme of rockets. To see the entire list of activities, with all videos/resources follow this link:

<https://www.jpl.nasa.gov/edu/teach/tag/search/Rockets>

Tangram shape rockets

(EYFS/KS1 maths – shape recognition)

In this activity, learners use shapes to build pictures of rockets:

<https://www.jpl.nasa.gov/edu/teach/activity/tangram-rocket/>



Drink straw rockets

(KS1-2 – scientific investigation)

In this activity, learners build paper rockets and launch them using paper drink straws. They can investigate distance travelled by their rockets:

<https://www.jpl.nasa.gov/edu/teach/activity/straw-rocket/>





Investigations using rockets

KS2/3

Carrying out investigations – working scientifically

The resources below can be used for learners in KS2 and 3 to plan and carry out scientific investigations using rockets.

For older learners, NASA's Glenn Research Centre has activities for years 9-12 [here](#) linked to thrust and rocket launch.

Propulsion pop!

In this investigation, learners use a chemical reaction to propel a rocket. By changing the components of the reaction, learners can investigate the conditions that launch their rocket the furthest distance!

https://www.grc.nasa.gov/www/k-12/BGP/Robert/Propulsion_Pop2_act.htm



Newton's third law balloon rockets

In this investigation, learners use a balloon of air to propel a rocket. By changing the volume of air in the balloon, learners can investigate the conditions that launch their rocket the furthest distance! The investigation includes calculations of volume and thrust:

https://www.grc.nasa.gov/www/k-12/BGP/Shari_N/propulsion_act.htm





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Other space resources

Let's Go Live!

Maddie and Greg's daily lockdown Science show has a whole week of episodes linked to space, including lots of hands-on science activities:

<https://letsgolivescience.com/theme/mission-on-space/>

NASA's Space Place!

This website contains crafts, videos, games and investigations linked to the theme of space. Their resources include colouring sheets, design and building activities, challenges and crafts to do.

<https://spaceplace.nasa.gov/menu/parents-and-educators/>



NASA at home

This website contains a huge range of activities for learners of all ages.

<https://www.nasa.gov/nasa-at-home-for-kids-and-families>

We hope that you enjoy participating in some of activities within this pack, to inspire the scientists, engineers and mathematicians of the future! Reach for the stars!



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