Activity Book

Join Lauren and Lucas on an exploration to find out about mining and minerals!

This educational resource has been produced by Sharon Strugnell, a chartered Engineer based in the UK.

Sharon Strugnell is a civil engineer who works on designing and delivering projects for mines and transport infrastructure all around the world. She currently leads a mining team at WSP, a company that helps develop important projects all over the world. Sharon has worked on big civil and mining projects like the London Underground tunnels and has written papers about her work.

'I wanted to create this education resource for use in primary schools across the UK and Ireland with a view to it helping the future generations understand the importance of mining and the impact it has on our everyday lives. It will hopefully encourage young people to consider a rewarding profession in mining!'

Please use this book within your schools and various learning environments to help educate younger people about the exciting and important work that the mining sector is doing all around the world!

We would like to extend our heartfelt gratitude to Wyn Griffith (MIMinE), Adrian Carley (MIMinE), and Christine Blackmore, IOM3 President, for their invaluable assistance behind the scenes. Our thanks also go to IOM3 for their excellent design work, and to the Midland Institute of Mining Engineers for generously funding the initial print run.

Designed by the Institute of Materials, Minerals and Mining (IOM3)

A Day at the Mine

Once upon a time, in a small city in the middle of England called Doncaster, lived two curious children named Lauren and Lucas. They loved exploring the world around them and learning new things. One sunny morning, their parents announced an exciting day trip to a nearby underground mine. Lauren and Lucas could hardly contain their excitement!

The next day, they set off, eager to discover the secrets of mining. As they arrived at the mine, they were greeted by Mrs Stone, a friendly miner with a twinkle in her eye.

The children were taught how to be safe during their visit and given special clothes to wear. Mrs Stone led them deep into the mine, where they saw huge machines digging into the earth. "This is where it all begins," she explained. "We use these machines to break up the rock and find valuable minerals like iron, copper, and gold."

"Welcome, young explorers! Today, you'll learn how we extract minerals from the ground and turn them into everyday products."

Lauren and Lucas watched in awe as the miners worked. "But how do you know where to dig?" Lucas asked.

"We use special tools and maps to find the best spots," Mrs Stone replied. "It's like a giant treasure hunt!"

The materials are conveyed back to surface. Next, they visited the processing plant, where the raw minerals were crushed and separated from the rock. "This is where the magic happens," Mrs Stone said. "We use different methods to extract the minerals, like using water to wash away the dirt or chemicals to dissolve the rock."

Lauren was fascinated. "So, what happens to the minerals after this?"

Mrs Stone smiled. "They go through even more processes to be refined and purified. For example, iron is melted down and turned into steel, which we use to build cars and buildings. Copper is used in electrical wires, and gold can be made into jewellery."

As the day came to an end, Lauren and Lucas realised just how much work went into mining and processing minerals. They thanked Mrs Stone for the incredible adventure and headed home, their minds buzzing with new knowledge.

That night, as they lay in bed, Lauren turned to Lucas and said, "Who knew there was so much to learn about mining? I can't wait to tell everyone about our adventure!"

Lucas nodded. "Me too. And maybe one day, we'll go on another adventure and learn even more."

And with that, the two young adventurers drifted off to sleep, dreaming of the many discoveries that awaited them.

Q & A

Can you answer the following comprehension questions based on the story:

1. Where did Lauren and Lucas live?
2. What did Lauren and Lucas love to do?
3. Who announced the exciting day trip to the mine?
4. Who greeted Lauren and Lucas at the mine?
5. What did Mrs. Stone say they would learn about during their visit?
6. What did Lauren and Lucas see when they went deep into the mine?
7. What minerals did Mrs. Stone mention they could find in the mine?
8. What happens to the minerals after they are extracted from the ground?
9. What are some uses of iron, copper, and gold mentioned in the story?
10. How did Lauren and Lucas feel at the end of their adventure?

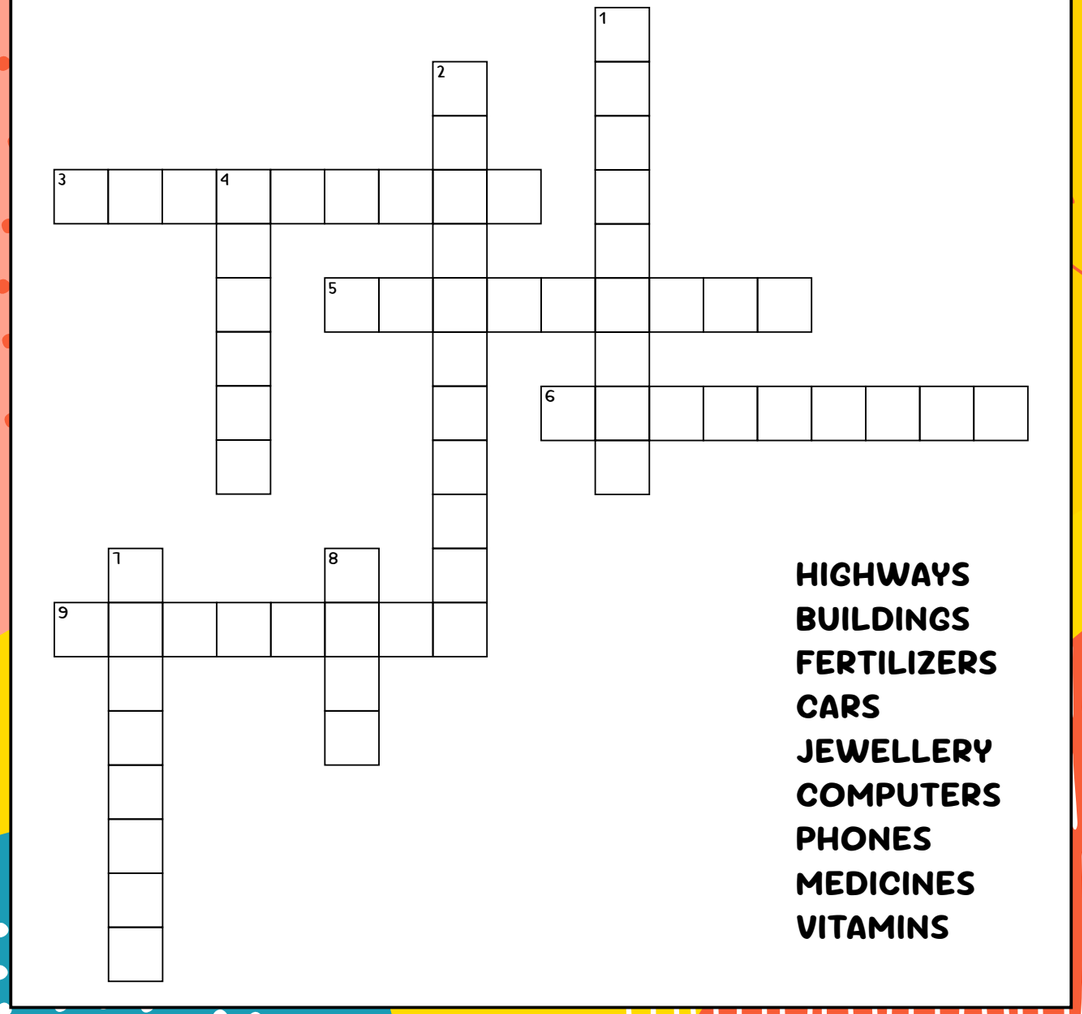
Lauren and Lucas discovered several other fascinating minerals during their adventure. Here are a few they learned about:

1. **Quartz**: A common mineral used in making glass and electronics
2. **Bauxite**: The primary source of aluminium, which is used in everything from cans to airplanes
3. **Graphite**: Used in pencils
4. **Gypsum**: A mineral used to make plaster for wall building

Each mineral has its own unique properties and uses, and Lauren and Lucas were amazed at how these natural resources were transformed into everyday products. **Their adventure taught them just how important mining is to our daily lives!**

Kriss Kross

Can you help Lauren and Lucas identify the various everyday objects in the Kriss Kross below? Fit the words listed below into the boxes...

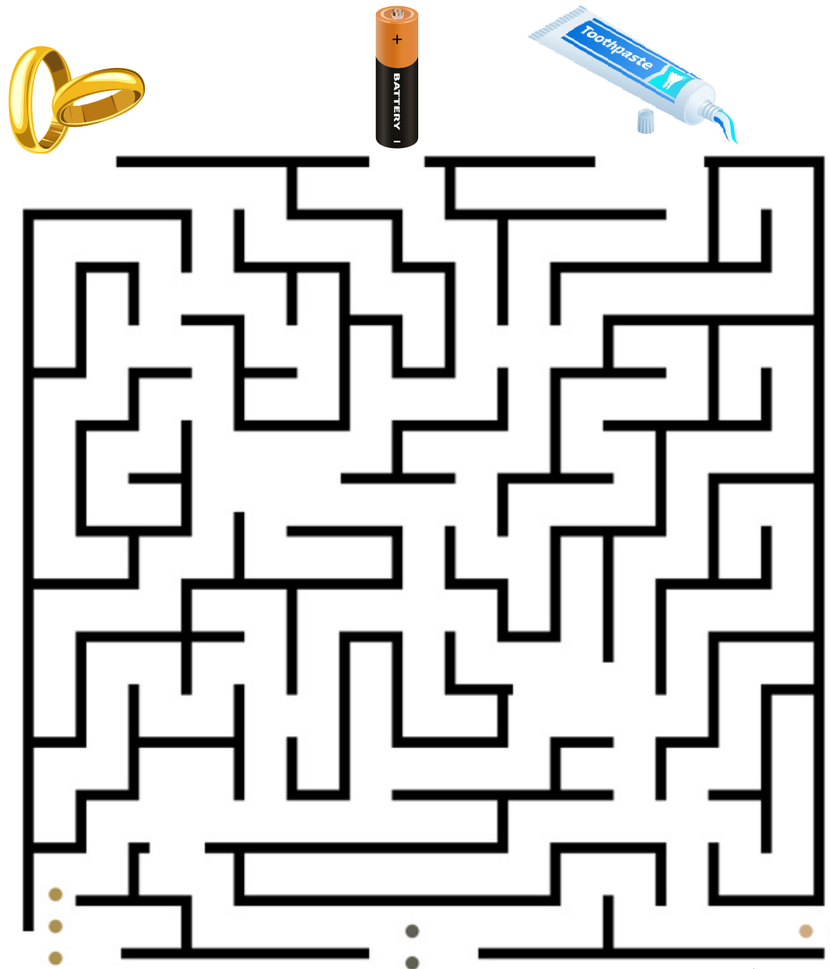


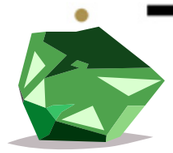
HIGHWAYS
BUILDINGS
FERTILIZERS
CARS
JEWELLERY
COMPUTERS
PHONES
MEDICINES
VITAMINS

1. MEDICINES
2. FERTILIZERS
3. COMPUTERS
4. PHONES
5. BUILDINGS
6. JEWELLERY
7. VITAMINS
8. CARS
9. HIGHWAYS

Maze

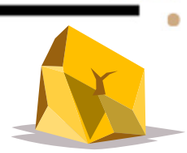
Can you help Lauren and Lucas weave through the maze to match the various everyday objects to the corresponding mineral?





Fluorite
Fluorite is difficult to mine as it is brittle and very reactive. It typically forms in crystals and can be found in a range of colours. Under UV light, fluorite will glow.

Lithium
Lithium is so light that it can float on water, although it is reactive to water and will fizz and release gas. Lithium was first discovered in 1817, however, it was one of the three elements created in the Big Bang almost 14 billion years ago.



Gold
Most gold produced in the UK comes from Dolgellau in North Wales. Gold is incredibly dense, it also reaches a boiling point at 2,836 °C.

The Lifecycle of a Quarry

(What happens and who does it?)

For more information visit www.minerals-matter.co.uk

IQ The Institute of Quarrying

COMMUNITY ENGAGEMENT (Throughout the quarry lifecycle!)

Village Hall

Quarry NEWS – VILLAGE HALL MEETING TO DISCUSS THE QUARRY...

STAGE 1

Identify a need (e.g. a major new construction project).

EST SMT

"We're going to need a lot of ballast!"

HS2

STAGE 2

Confirm what type of quarry products fulfil this need.

"Product C best meets the need..."

SMT GEO

Quarry Products: A B C D

STAGE 3

Identify where the raw materials for the quarry product exist.

"That's the best location geologically speaking!"

ENG GEO

STAGE 4

Undertake initial prospecting of the new quarry site.

FIN **FINANCIAL VIABILITY** Will the new quarry provide a financial return on the initial investment?

OWNERSHIP Who currently owns the land where the new quarry will be sited? EST LEGAL

GEOLOGY Is the rock of a suitable quality and consistency for the intended purpose? GEO

PLANT REQUIRED What machinery and plant is required to extract the material from the quarry? ENG

SITE PLAN How will the site be designed to operate efficiently and safely? OPS

Is the new quarry site viable?

NO

YES

STAGE 5

Prepare initial plans for the new quarry site.

"We need to ensure the plan for the new quarry aligns with the Local Authority plans."

NEW QUARRY PLAN MINERAL PLANS COUNTY PLAN

EST LEGAL

STAGE 6

Submit planning application for the new quarry site.

ENG ENVC LARC

PLANNING APPLICATION – NEW QUARRY ANYWHERE

Planning application successful?

NO

YES

STAGE 7

Prepare site to enable quarrying operations to start.

Supplier Contracts

PROC

ADM CON ENG ENVC FIN HR GEO HS ICT LARC OPT PROC SMT TECH TRL

STAGE 8

Quarry site **OPENS**.

"We're safeguarding the wildlife found here to minimise the impact on them from quarry operations."

"Protecting wildlife is a key element of environmental management."

ENG SMT OPS TECH

RSPCA

ENVC EST

BIG Diggers – PLANT ORDER FORM

STAGE 9

Environmental restoration work on-going throughout the operational life of the site.

EST ENVC LARC

Face to Face Training E-learning

HR

Competency Framework

QUARRY OPERATIONS TRAINING MANUAL
- Health & Safety
- Plant Operation
+ much more!

OPS

CONSTRUCTION SITE - KEEP SAFE!

RECRUITING NOW!!!

"We'll plant the tree's for the environmental screening of the quarry site here."

ENVC OPS

STAGE 10

Site **CLOSES**. Final site environmental restoration work completed (in line with the future use of the site).

ENVC EST

Not all minerals and materials are mined underground, some come from quarries. Follow the diagram to see the different stages of the Lifecycle of a Quarry and who gets involved!

TIMELINE

Planning (0 to 5 years) | **Site Operation** (5 to 50 years dependent on quarry size and complexity) | **Restoration** (1 - 5 years)

JOB ROLES KEY

- ADM Administration
- CON Contracting
- ENG Engineers
- ENVC Environmental Consultant
- EST Estates
- FIN Finance
- GEO Geologists
- HS Health and Safety
- HR Human Resources
- ICT IT
- LARC Landscape Architect
- LEGAL Legal
- OPS Operations
- OPT Plant Operatives
- PROC Procurement
- SMT Sales and Marketing
- TECH Technicians
- TRL Transport and Logisitcs

Important Note: This a representation of what typically happens within the quarrying industry. Different types of quarry operations will feature different processes depending on the nature of the materials being quarried.

Word Search

Can you find some common terminology used in the mining industry?

DRIFT
GEOLOGY
ROCKS

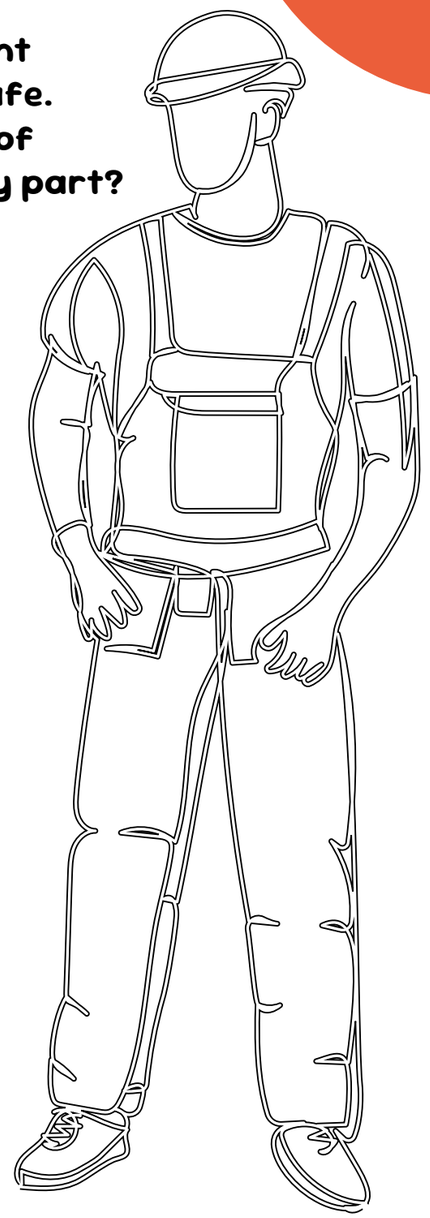
MATERIALS
STRUCTURES
MINERALS

MINING
WASTE
WATER

S T R U C T U R E S T M
M S M Y I C Y S Z I A A
I S D K W G L K Y W I T
X C I L O A R W I F L E
M I I L R A S A M R I R
I M O E R K T T M R N I
I E N U C E F E E T G A
G I R O I I A R S Y S L
M R R N R M I N I N G S
Y E E D R E R E Z I U T

Meet Maurice the Miner

Safety equipment is very important to keep everyone on a mine site safe. Can you match the various pieces of safety equipment to the right body part? Why not colour him in?



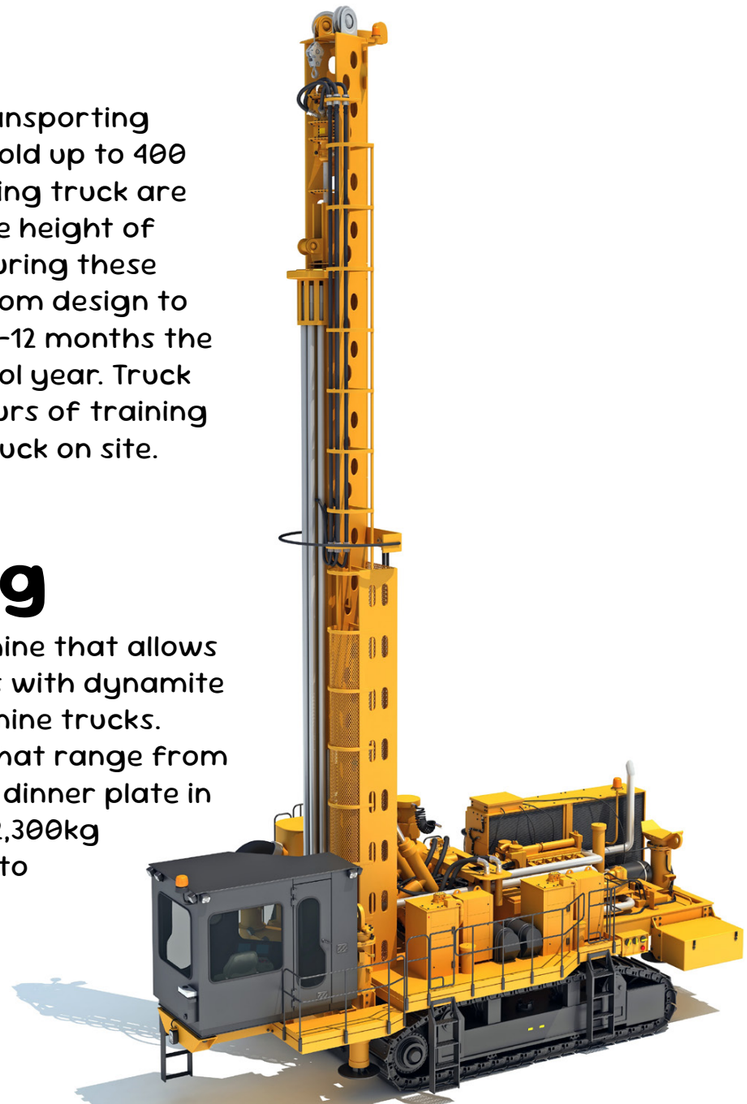
Machines

Mine Truck

Mine trucks are used for transporting mining materials, and can hold up to 400 tonnes. The wheels on a mining truck are roughly the equivalent in the height of a female giraffe. Manufacturing these trucks is a huge task and from design to testing it can take around 7-12 months the equivalent of an entire school year. Truck drivers need around 400 hours of training to be able to drive a mine truck on site.

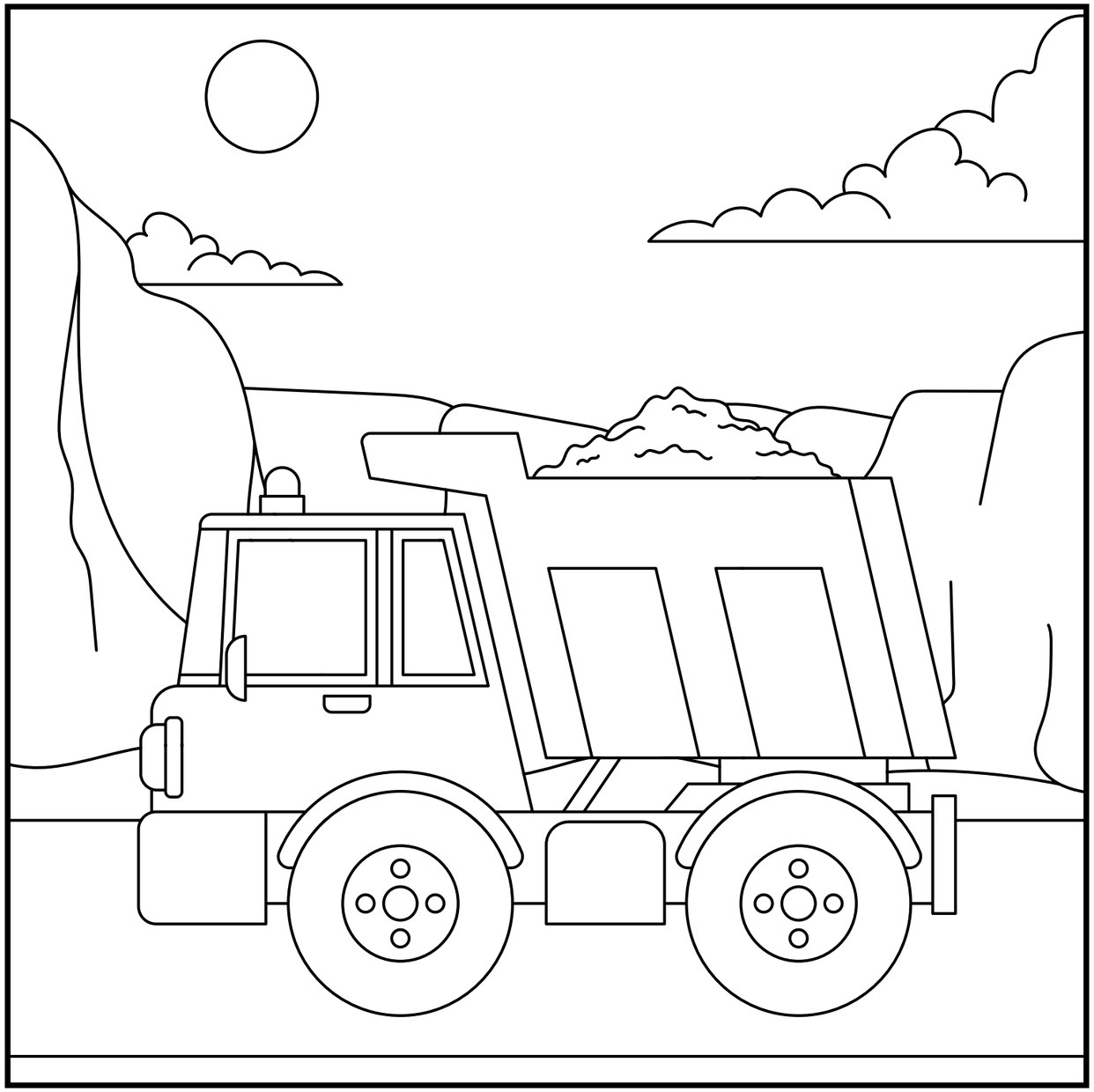
Blasthole Rig

A blasthole rig is a big machine that allows miners to break up minerals with dynamite so they can be loaded into mine trucks. Generally, they bore holes that range from the size of a tennis ball to a dinner plate in diameter. Some rigs weigh 2,300kg which is roughly equivalent to 3 male elephants.



Colouring

Colour this Dumper Truck on a mine site.
What colour do you think the truck should be?



Match the Mineral

Can you un-jumble the lines to work out which country in the world these common minerals can be found?
Once you have found the country, can you name some of the everyday household objects you find these minerals in or what they are used for?

ALUMINIUM
Country:
Use in:

COPPER
Country:
Use in:

NICKEL
Country:
Use in:

URANIUM
Country:
Use in:

GYPSUM
Country:
Use in:

AGGREGATES (Sands and Gravel)
Country:
Use in:

DIAMONDS
Country:
Use in:

SILVER
Country:
Use in:

IRON ORE
Country:
Use in:

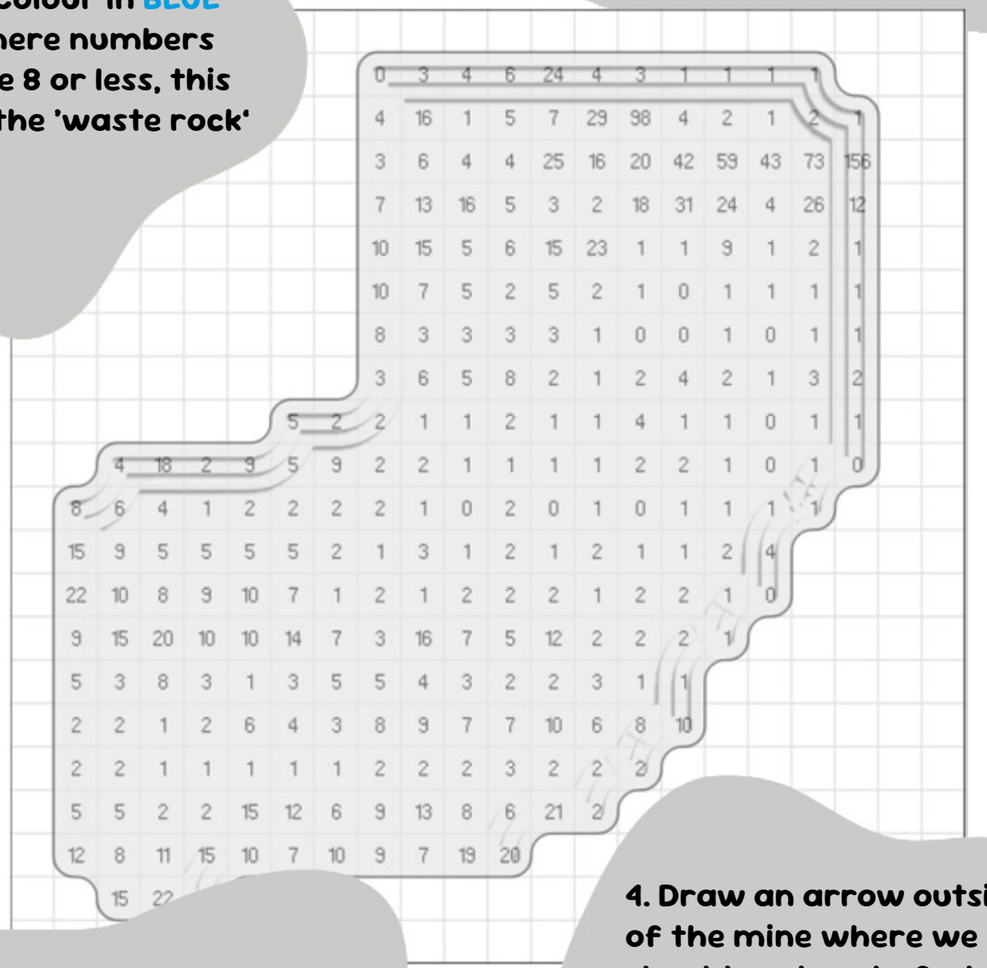
Where should we mine first?

In mining, "grading" means checking how much valuable stuff, like gold or other metals, is in the ground.

Here are grades from blastholes in a real gold mine, the mine geologists use these to tell the mine trucks where to find ore.

1. Colour in **RED** where numbers are above 15, It is here where we will mine first

2. Colour in **BLUE** where numbers are 8 or less, this is the 'waste rock'

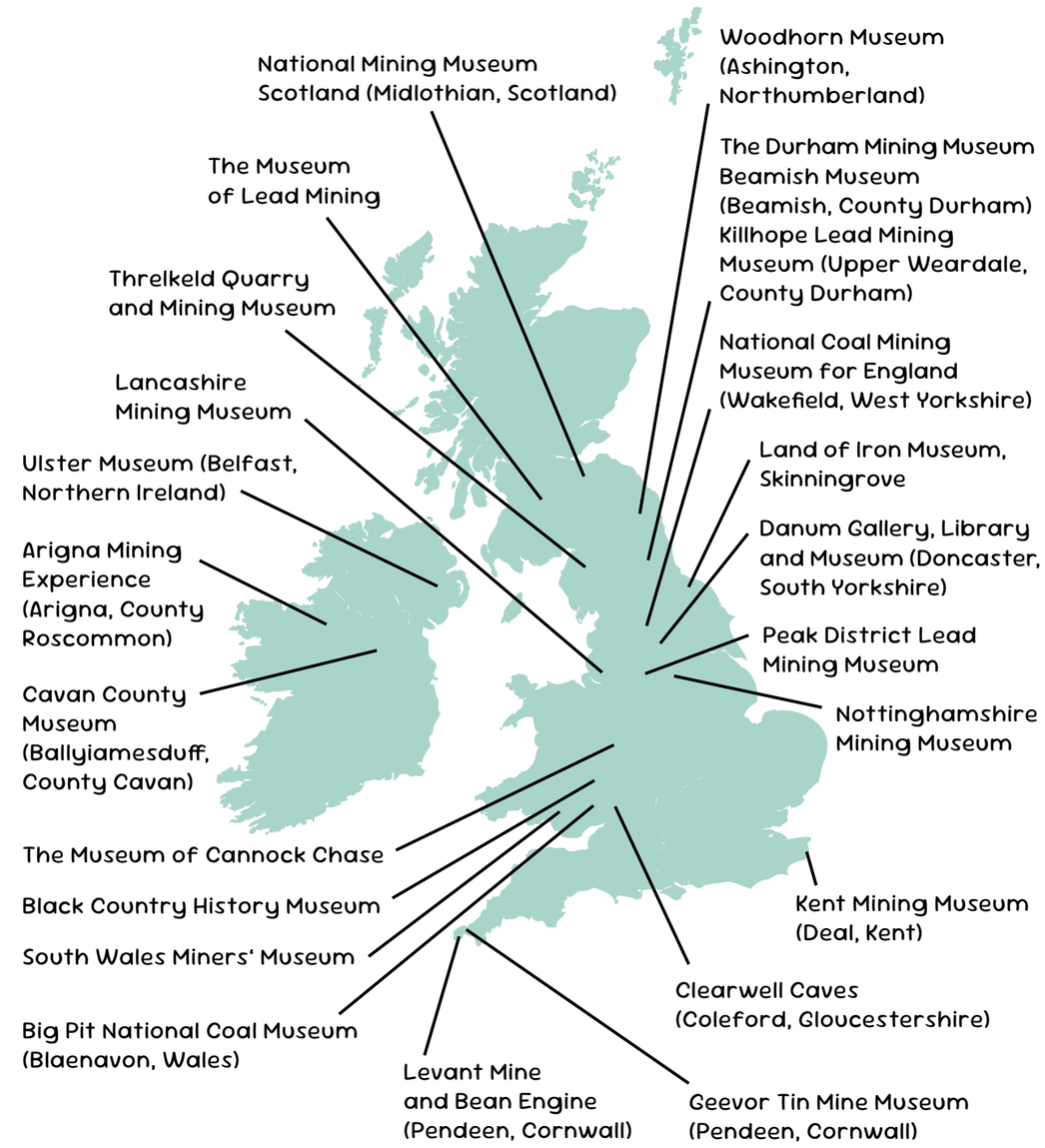


3. Colour in the other parts of the mine in **YELLOW**

4. Draw an arrow outside of the mine where we should explore to find more high gold grades

Where can I learn more about Mining in my area?

There are many museums and educational centres across the UK and Ireland where you can learn lots more about your local mining activities and history. Check out the map below to see some of your nearby Museums that exhibit local mining history and current practice!



Our Partners

This activity booklet was produced and distributed with the kind support of the following industry organisations:

The Midlands Institute of Mining Engineers (MIMinE) promotes mining engineering through education, research, and professional development.

WSP is one of the world's leading engineering and professional services firms. With 13,900 people, and 5,200 focused on mining, we are delivering responsible solutions today, for a sustainable tomorrow.

IOM3 Institute of Materials, Minerals & Mining

IOM3 is a professional membership organisation, supporting people at all stages of their careers in the materials cycle through a broad range of activities, including events for teachers and young people.

SRK Consulting (UK) Ltd is an independent, international consultancy providing focused advice and solutions to clients, mainly in the earth and water resource industries.

Komatsu manufactures mining equipment, construction and forestry equipment and strives to be a valued community partner across the globe. We are committed to meeting the world's need for sustainable solutions.

The Institute of Quarrying helps people working in the minerals industry to develop in their careers by giving support, training and development.

For more than 100 years, the purpose of MRSL has been to 'keep people safe.' Today MRSL provides a mines rescue service to supports underground miners and lots of training that helps 'keep miners safe.'

Minerals Matter works across the sector to share what it's like working in quarrying and mining with young people, and how important minerals are to our everyday life.

The Mining Association of the United Kingdom is the voice for the underground mining sector, representing 28 mines in all four nations across 12 different minerals.

Shaft and Tunnel Consulting Services

Shafts and Tunnels specialize in the design, construction and remediation of underground developments, providing seamless solutions from concept to construction in challenging ground conditions.