

MASON BEE WORKBOOK

for Elementary Students

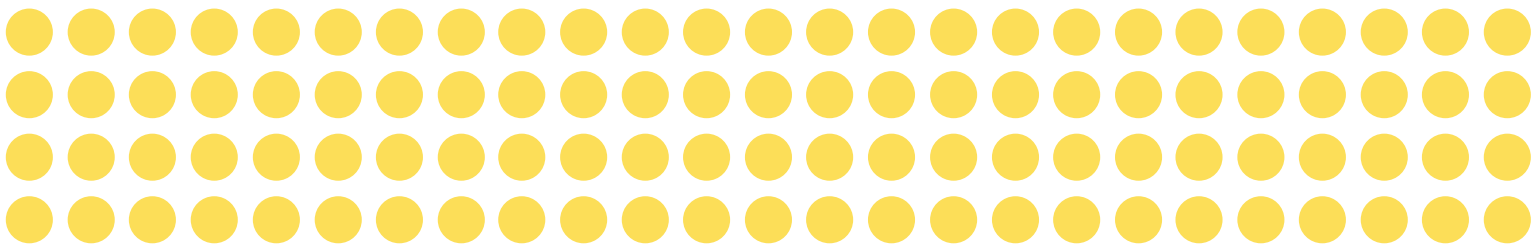


Featuring
Reading,
Science,
and Math



RENT MASON BEES

www.rentmasonbees.com



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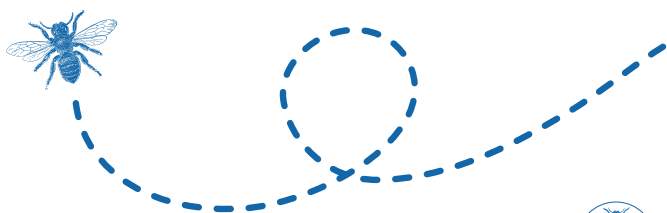
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This packet is designed so most of it can be completed over the course of a week, but is flexible and can be adjusted to meet your needs. Each section has a reading with questions and accompanying worksheets. If you are doing this as part of homeschooling with your students, all the information they need to answer the questions is included so they do not need to look elsewhere. Young students will need help with the reading.

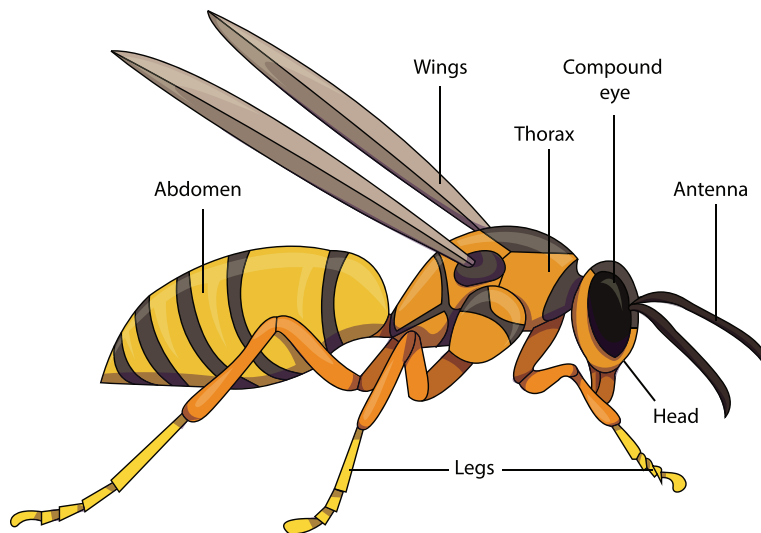
The mason bee and leafcutter bee tracking will take longer and need to be completed throughout the spring and summer seasons when the bees are flying. Mason and leafcutter bee kits can be rented from <https://www.rentmasonbees.com/>. They have all-inclusive bee rental kits ready to ship to your door. All you will need to do is hang the small bee house in your yard and observe the bees during their pollination season. These bees are safe around children and pets and really very little to no maintenance. Return shipping labels are included to send the kit back at the end of the season, so the bees can be cleaned and cared for.



BEE ANATOMY AND HOW THEY NEST



All bees have similar anatomy. They all have **three main parts**: a **head**, **thorax**, and **abdomen**. On their head they have eyes, antennae and mandibles. The thorax is the middle section of the bee. This is where the bee's legs and wings are attached to its body. The abdomen is the last part of the bee.



HONEY BEES

Honey bees have **black and yellow stripes**. You have probably seen them flying around your garden or yard when flowers are blooming, or maybe even had to watch your step when running on your lawn because they love clover flowers. They are **social bees** that live in hives. Their hives can be in structures provided by beekeepers or in hollowed out trees. The worker bees build a comb with wax that they produce and this provides the structure for their hive. They will fill this comb with honey and baby bees called larvae (plural of larva).



MASON BEES

Mason bees are often mistaken for flies. They have a **blue and green shine** on their bodies and males have a little white patch of hair on their heads, kind of like a beard. If you look closely, you will also see that they have four wings whereas flies only have two. Mason bees are about half an inch long and the females are bigger than males. The picture on the right shows a female on the top and two male bees on the bottom. Mason bees lay their eggs inside of holes. In your back-yard they will nest in hollow plant stems, holes drilled by woodpeckers or in wood blocks provided by bee keepers. Mason bees are **solitary bees**. That means that each female bee collects her own food and lays her own eggs. Since there is no hive and queen bee to protect, a mason bee will not sting you.



A female can lay 20-30 eggs in her lifetime and will continue filling holes until all her eggs are laid. The mason bee will lay 5-7 eggs in each hole and will make sure to place the females in the back and males in the front. She supplies each egg with pollen, which becomes food for her baby once it is born. After an egg is laid inside of the hole, she collects a mouthful of mud from your yard and builds a mud wall to protect that egg. She will gather more pollen, lay another egg, and build another mud wall. She will continue this process until she gets to the front of the hole and then plugs the hole with a thick mud cap to protect her eggs. Each developing baby bee gets its own room where it grows from an egg to a full grown bee.

Differences between mason and honey bees:



HOLES VS. HIVES – Honey bees work in a hive that produces honey and the queen lays eggs. Mason bees lay eggs in small tunnels or holes and don't produce any honey.



WHO'S THE QUEEN – Honey bees have one queen that lays all the eggs. Mason bees are solitary bees. All females lay eggs and they work alone.

LEAFCUTTER BEES

Leafcutter bees are smaller than mason and honeybees. They are **black with white or silvery hairs and have small stripes on their abdomen**. Like the mason bee they are **solitary** and lay their eggs in holes. Just like mason bees, leafcutter bees lay multiple eggs in their chosen nesting hole. Instead of using mud like mason bees to protect their eggs, leafcutter bees use leaves to wrap around each egg. She will wrap about 15 pieces of leaves around each one of her eggs.



Fun facts



One mason bee
can pollinate as
much as

100
honey bees

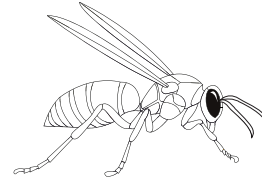
Each mason bee
can visit up to

2000
flowers a day

Farmers
release

1,000
bees per acre to
pollinate their
crops

QUESTIONS:



1. What are the three main parts of a bee's anatomy?

2. Honey bees are *(circle one)* solitary bees -OR- social bees

3. Mason bees are *(circle one)* solitary bees -OR- social bees

4. Leafcutter bees are *(circle one)* solitary bees -OR- social bees

5. Match each of the bees to its picture

Honey bee



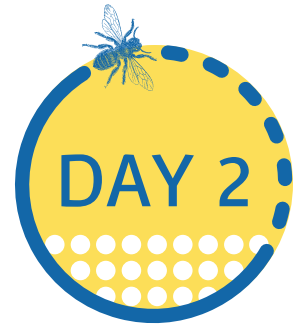
Mason bee



Leaf cutter bee



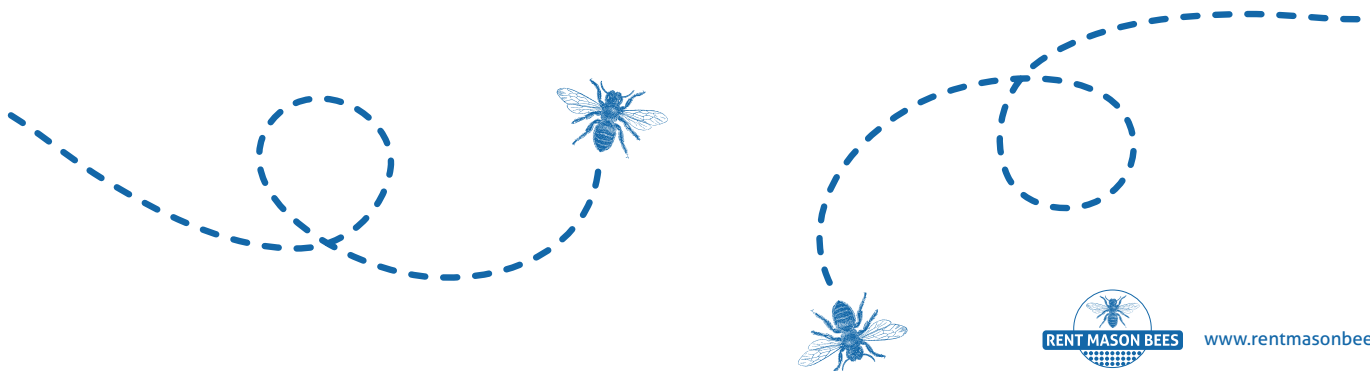
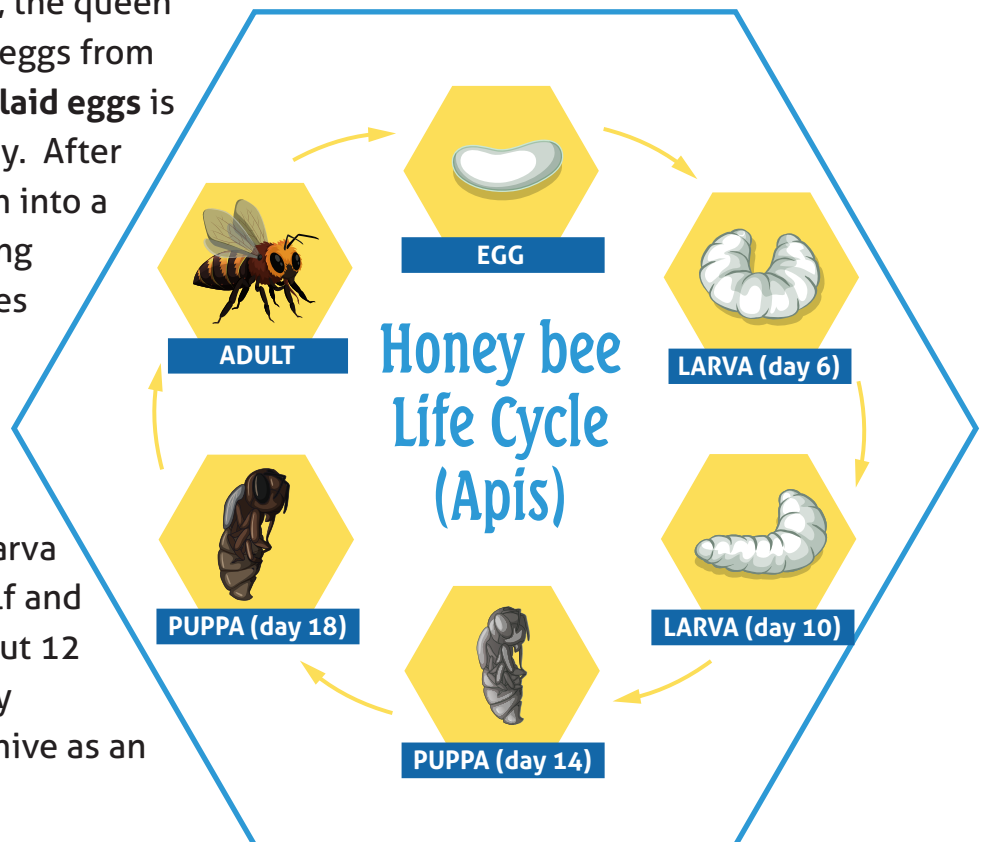
LIFE CYCLES AND DEVELOPMENT



All bees go through the same basic life cycle. There are **four** main stages of their life cycle. They start as an **egg**, then develop to **larva**, then to **pupa**, and finally become an adult. However, the timing of each stage changes depending on the species.

HONEY BEES

The queen bee's only job is to lay eggs. She can lay up to 2,000 eggs a day! In each cell of the honeycomb, the queen will lay a single egg. She lays eggs from spring to fall so having **newly laid eggs** is a sign that the queen is healthy. After three days, each **egg** will hatch into a **larva** which grow quickly, eating almost constantly—1,300 times per day. After five days, they have grown to 1,570 times their initial size. At this point, the worker bees will seal in each larva with wax, and the larva will spin a cocoon around itself and turns into a **pupa**. It takes about 12 days, then they chew their way through the wax cap, join the hive as an **adult** bee, and get to work.



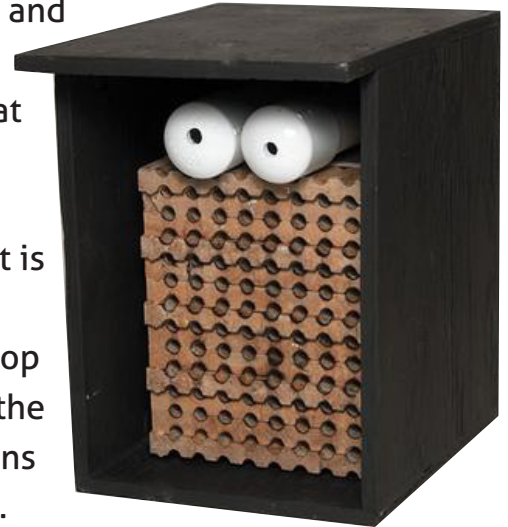


LIFE CYCLES AND DEVELOPMENT



MASON BEES

Adult mason bees hatch out of their cocoons in the spring and will fly for 6-8 weeks. The female bees set to work laying **eggs**. They will gather pollen and nectar to form a ball that will be the food source for the developing bee. Eggs are laid during April and May. It takes a week for the egg to hatch into a larva. Then the **larva** will eat the pollen ball it is sitting on and spin a cocoon around itself, turning into a pupa. During the summer the **pupa** will continue to develop taking a month to turn into a full formed adult bee. Over the winter mason bees hibernate (sleep) inside of their cocoons and then will emerge in the spring to start the cycle again.



LEAFCUTTER BEES

Leafcutter bees hatch in the summer, pollinate, and lay their **eggs**. The leafcutter bee eggs will remain as eggs until the next spring. When it starts to warm-up in the summer, the egg hatches and becomes a **larva**. The larva will eat the pollen in its leaf cell and develop into a **pupa**. The pupa continues to develop, eventually becoming a full grown **adult** bee. After a total of about three weeks, the adult bees will chew out of their leaf cells and fly for the summer, pollinating summer flowers and laying their own eggs.



QUESTIONS:



1. Match the following stages of the life cycle to the correct picture (pictures not to scale):

Egg



Larva



Pupa



Adult



2. What is a sign that your queen honeybee is healthy?



POLLINATION



All three bees play an important part of our food chain to pollinate crops and produce food for our grocery stores. Because they pollinate in different ways, are different sizes, and fly at different times of year, we use each bee to pollinate different crops.



HONEY BEES

Honey bees are the most well-known and widely used pollinator. They start flying when it reaches 60 F degrees outside; they fly during the spring and summer. The queen bee is constantly laying eggs so honey bees can be moved from location to location and pollinate multiple crops throughout the year.

Honey bees pollinate in a methodical way. When they are pollinating fruit trees, they visit each blossom on a branch and then move to the next branch on the tree. Honey bees are great at collecting pollen. When they gather pollen from flowers, they wet it with their saliva and store it on their legs in baskets called corbiculae (plural of corbicula). When they do this very little pollen falls off. They bring the pollen back to their hives to feed their offspring



In the early spring mason bees are used commercially to pollinate almonds and other fruit crops which helps to take some of the stress off of the honey bees. Honey and mason bees work well together. When crops have multiple bees pollinating them, they receive more thorough pollination and farmers see increases in yield. This means more food in your grocery stores! One cherry orchard went from four tons to ten tons of fruit produced per acre when mason bees were added to help the honey bees!





POLLINATION



MASON BEES

Mason bees are a **spring pollinator** and can fly at lower temperatures than other bees. They will start flying when it is only 50 degrees Fahrenheit outside. They will pollinate just about anything that is blooming during the spring, including broad leaf maple, madrone, fruit trees and even dandelions. Mason bees are incredible pollinators because they “belly flop” onto flowers and get pollen all over their bodies. Because they are clumsy little bees, this enables them to pollinate 95% of the flowers they flop on and they can visit up to **2,000 flowers a day**. In fact, one mason bee pollinates as much as 100 honeybees. In addition, mason bees bounce all around from tree to tree and flower to flower. This works incredibly well for crops that need **cross pollination** (pollination from a different tree) for the fruit to grow.



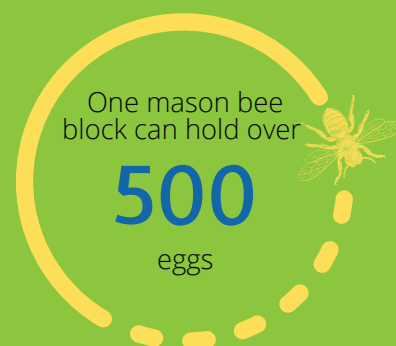
Why are they important to the ecosystem?

Mason bees are not picky pollinators, they will collect pollen and nectar from just about any plant that’s blooming in the early spring. That means not only do mason bees help us grow more food, but they pollinate our native plants too. That makes it so the plants around us are healthier, can grow larger, and can better filter our air and water, boosting the overall health of our ecosystems.





Fun facts



- **CLUMSY LITTLE BEES** – The honey bee carefully collects pollen on their back legs, whereas the mason bee **BELLY FLOPS** onto the flower and gets pollen all over their bodies.
- **BEE AMAZED!** – It's good to be clumsy. Mason bees pollinate 95% of the flowers they land on.
- **HARD WORKERS** – Mason bees visit up to 2,000 flowers a day.
- **HELP HONEY BEES** – It only takes 400 female mason bees to do the work of 40,000 honeybees.
- **FARMERS LOVE MASON BEES** – Farmers release 1,000 mason bees per acre to pollinate their crops, which helps them produce more food.
- **APPLES, BLUEBERRIES, ALMONDS, PEARS & CHERRIES** – The food you eat was made by a pollinator.

LEAFCUTTER BEES

Leafcutter bees fly in the **summer**, usually hatching around July 4th. Leafcutter bees usually start flying at 75 degrees F; they need warmer temperatures than mason and honey bees to fly. Their primary commercial use is to pollinate **alfalfa**. Alfalfa is a vital part of our food chain; farmers use alfalfa to feed their dairy cows and pigs. Leafcutter bees are also increasingly being used in **blueberries** as well due to the decline in honey bee population.



QUESTIONS:



1. What percent of our supply of honey bees travel to California to pollinate almonds?

2. How many flowers can a mason bee pollinate in a day?

3. Which bees are spring pollinators?

4. Which bees are summer pollinators?

5. What crops are leafcutter bees good at pollinating?





TAKING CARE OF BEES SO THEY CAN MAKE MORE FOOD



DAY 4

Bee keepers have an important role. They have to make sure that their bees stay healthy throughout the year so that their bees can pollinate our crops year and year. All bees can be harmed by parasites and fungi. It is a honey bee keepers job to inspect their hives and remove any pests that may try to harm their bees.



Mason bee keepers clean their bees each fall while the bees are hibernating. They **extract** the cocoons from the nesting material. Then the empty blocks are run over a flame to remove any fungi or mites and the waterproof cocoons are washed in bleach water. The bleach water will kill anything growing on the surface of the bee including chalkbrood, a kind of fungus that affects both mason and leafcutter bees.



Leafcutter bee keepers will set traps to remove parasites that might be hiding in the nesting material.

These steps ensure that when farmers or backyard gardeners receive bees the following year, the bees are healthy and clean.



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TAKING CARE OF BEES SO THEY CAN MAKE MORE FOOD



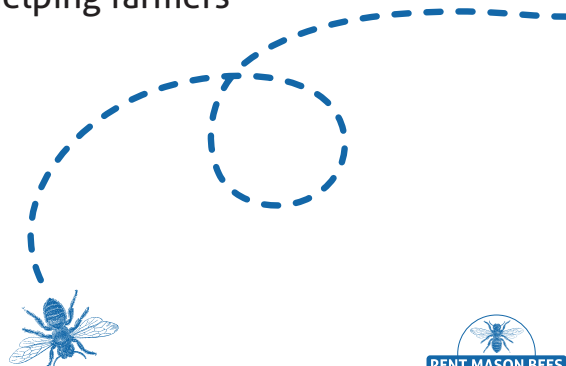
HOW FARMERS USE MASON BEES

Farmers use 1,000 mason bees per acre to pollinate their crops such as almonds, blueberries, apples, pears and cherries. We need to continue to grow our mason bee population so that we have more bees to pollinate our fruit orchards. By providing another bee to help pollinate our orchards, honeybees are less stressed and farmers crops grow more food.



HOW MASON BEES HELP HONEY BEES

Eighty percent (80%) of the honey bees in the United States are used in California for almond pollination. When they are moved from crop to crop, this can strain and overwork the bees. By using more mason bees on our farms, we can lessen the stress on the honeybee populations and utilize the amazing hardiness of the mason bee to keep our grocery stores stocked with fruit. By placing 1,000 mason bees on each acre in a farm we can use fewer honey bees taking the stress off the honey bee and helping farmers increase their yield.



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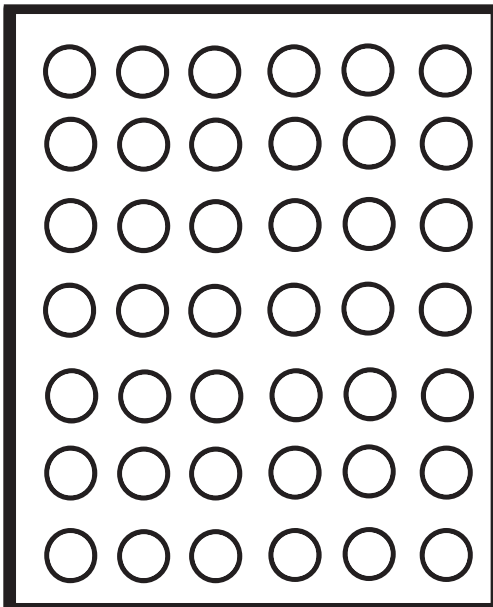


TAKING CARE OF BEES SO THEY CAN MAKE MORE FOOD

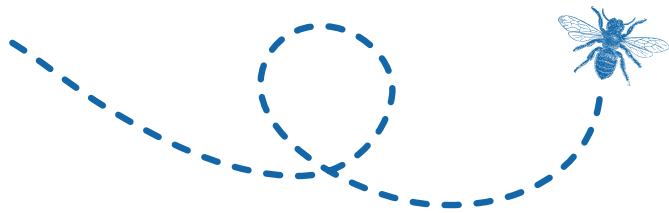


MASON BEE TRACKING

Below is an image representing your mason bee block. Check your block regularly and shade in the holes that are filled in. Use a different color and/or shading pattern each day so you can see how quickly it gets filled during the spring.



Assume each filled hole has five eggs in it, track how many eggs you have in your block as you go. For example: 3 filled holes would be $3 \times 5 = 18$ eggs. Use the chart below to track your full holes and add extra lines as needed.



Date checked	Number of full holes	x5	Total eggs
		x5	=
		x5	=
		x5	=
		x5	=
		x5	=
		x5	=
		x5	=
		x5	=
		x5	=
		x5	=
		x5	=
		x5	=
		x5	=
		x5	=



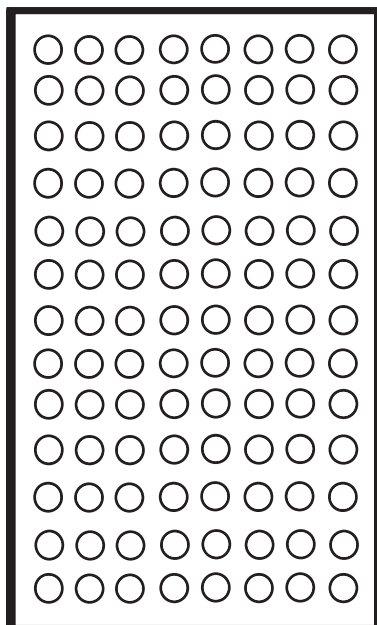


TAKING CARE OF BEES SO THEY CAN MAKE MORE FOOD



LEAFCUTTER BEE TRACKING

Below is an image representing your leafcutter bee block. Check your block regularly and shade in the holes that are filled in. Use a different color and/or shading pattern each day so you can see how it filled.



Assume each filled hole has four eggs in it, track how many eggs you have in your block as you go. For example: 3 filled holes would be $3 \times 4 = 12$ eggs. Use the Chart below to track your full holes and add extra lines as needed.



Date checked	Number of full holes	$\times 4$	Total eggs
		$\times 4$	=
		$\times 4$	=
		$\times 4$	=
		$\times 4$	=
		$\times 4$	=
		$\times 4$	=
		$\times 4$	=
		$\times 4$	=
		$\times 4$	=
		$\times 4$	=
		$\times 4$	=
		$\times 4$	=
		$\times 4$	=
		$\times 4$	=





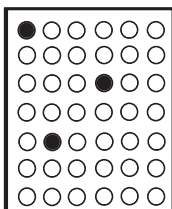
TAKING CARE OF BEES SO THEY CAN MAKE MORE FOOD



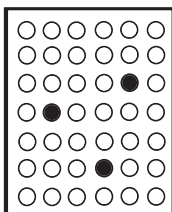
BEE MATH

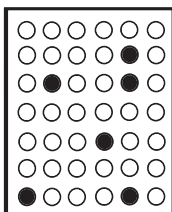
In the following mason bee blocks assume there are 5 bees in each hole, show your work to figure out how many bees are in each block:

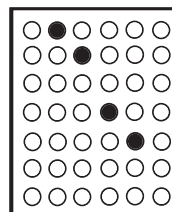
Example:

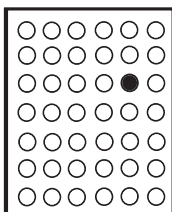


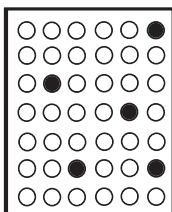
There are 3 full holes, there are 5 bees in each hole. $3 \times 5 = 15$

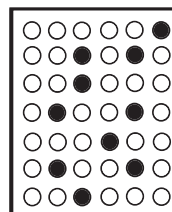






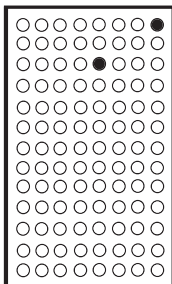




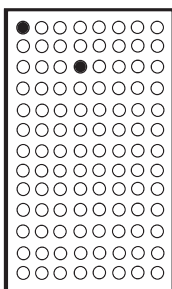


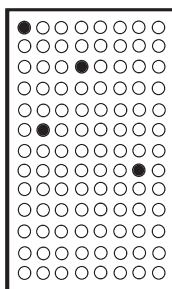
In the following leafcutter bee blocks figure out how many bees are in each block, assume there are 4 bees in each hole.

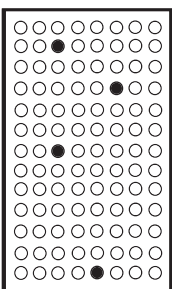
Example:



There are 2 full holes, there are 4 bees in each hole $2 \times 4 = 8$











RENT MASON BEES

ABOUT RENT MASON BEES

Rent Mason Bees is the only company in the country who has a mason bee program where you “host” mason bees. By simply hanging up a mason bee house and nesting block, your bees will pollinate your yard and then lay eggs or “baby bees” in your nesting block. The kids love seeing how many holes get plugged because inside every plugged hole are 3-5 babies.

At the end of the season, you mail your nesting block back to Rent Mason Bees and they clean and harvest the babies, who have now turned into cocoons. Then, next Spring your babies are sent to farmers all over Oregon, Washington, California and Idaho to pollinate crops.

The results are: your garden gets pollinated, healthy bees are put back into the ecosystem and farmers produce more food.

**For more information, visit our website
<https://www.rentmasonbees.com>**

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