



THE 2023 YOUNG MATHEMATICAL STORY AUTHOR (YMSA) COMPETITION

THE CINDY NEUSCHWANDER AWARD
(THE 12-15 YEARS OLD CATEGORY)

SHORTLISTED

'Laika is My Star' by Giulio D'Annunzio (13 years old)
at St George's British International School, Rome (Italy)

You can read the author's inspiration for the story and the judges' comments
on:

www.mathsthroughstories.org/ymsa2023

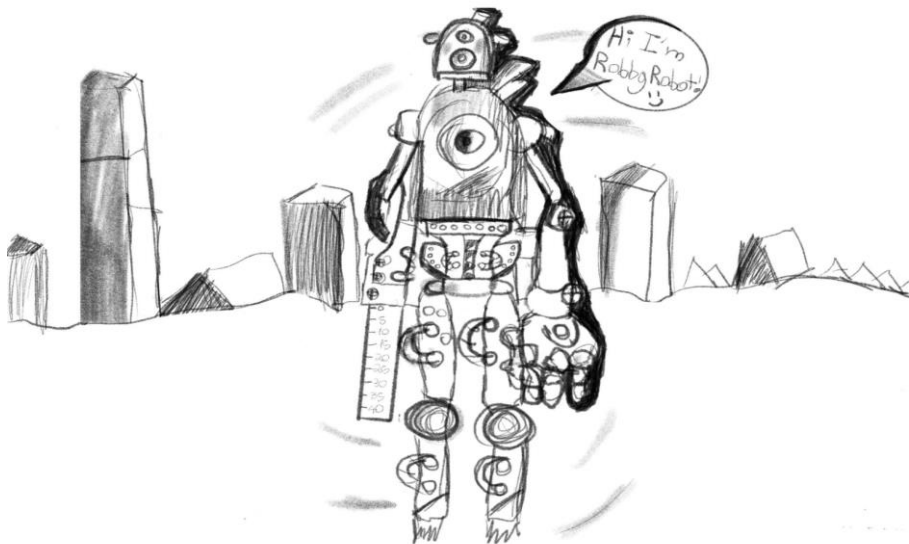
#YMSAMaths

Laika is my Star

1954-1957



This is Robby, a robot who *loves* where he lives, a big planet, orange and sandy full of iron, nickel and sulphur: Mars. He was left here a long time ago to measure the environment and things that surround him. The automaton came from a mysterious galaxy, distant light years from the solar system, where he is now. Yet one thing that he *doesn't love* is his emptiness, the feeling of when you have something incomplete, like doing your homework on the last minute and knowing that you won't get a good judgement from your teacher. But the thing is that he never forgets to do his homework, in fact every day he wakes up to work and fulfil his duty. The one problem that afflicts him is the constant thought of not having anyone in his life. Robby's one and only dream is to have someone he could lean on, someone that he could tell every time he feels sad, or tell him stupid things: like that one time he accidentally fell and a tear made his brassy colour android face greased with oil. And then he felt ashamed of himself even though there wasn't anyone watching. Even the mechanical being knew that this couldn't happen as there wasn't any other living organism on his planet besides himself. Since he had nothing else to do except from measuring, during his spare time he would calculate the circumference of the rocks. Robby would do this to fill the little craters that were on the Martian crust. The robot loved maths, because it was the only thing they had programmed in his 'computer brain'! Since he knew the formula by heart (2π times r) he would work out all the perfect circular pebbles that he would spend time finding on the brown floor. He would do this by using his special ruler hand to measure the diameter of the little stones and then write his calculations on the rocky floor. He would find this fun sometimes, but other times he would get bored and he would always end up feeling alone.



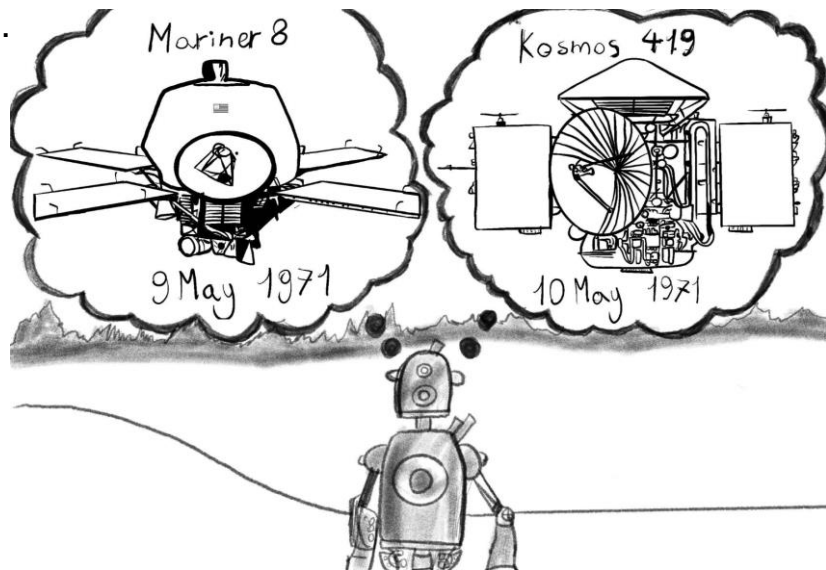
The robot worked from morning, when the bright, orange atmosphere filled the air, to evening, when the darker, grey atmosphere crowded up the space. But when the Sun faded away, Robby would look up towards the night, and observe what he called 'Infinite Suns' and he would stare mesmerized at the sky because one time he had witnessed the sighting of a weird flying machine. Inside it there was a cute and fluffy creature. Robby couldn't know this but that living thing was Laika, the first dog to travel to space. Unfortunately this interplanetary trip had affected her so much, that she passed away due to stress, panic and overheating of her artificial satellite called Sputnik 2. He had also noticed that it was orbiting around a weird, beautiful green, white and blue planet: Earth, which sparkled brilliantly with all its might. When he had seen all of this, Robby felt some kind of hope, he finally had the sensation that maybe he wasn't the only one who was living here, or even better: there were other organisms on different worlds! Days and days had passed, it was always the same thing, measuring spherical rocks and calculating the volume of his surroundings.



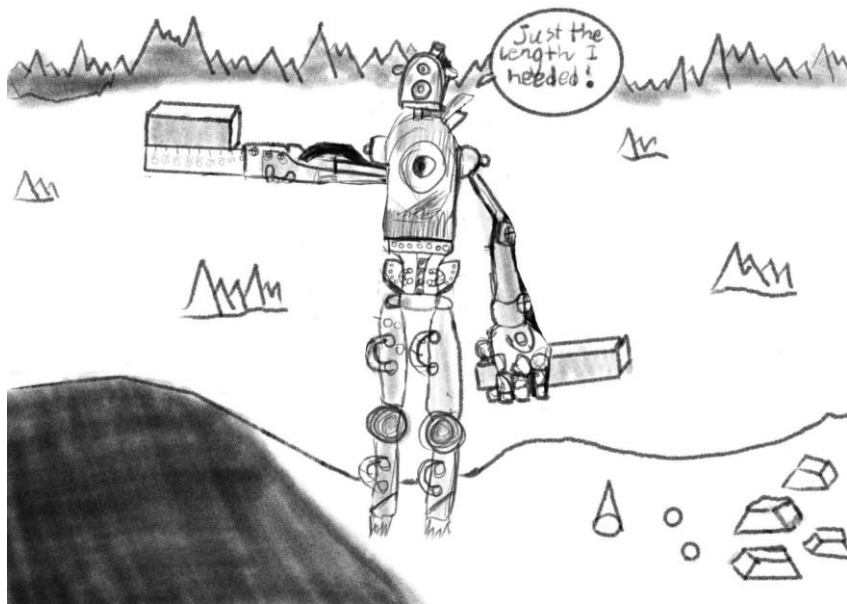
But on a day like any other, Robby was looking up at the black, nocturn sky and got lost in it. He was observing the beautiful 'Infinite Suns', when, from the corner of his eye, he saw a brighter sparkle coming from the left. He then turned quickly to look at them and noticed that they seemed as if they were moving, as if they were making some kind of a shape, as if they where moving on a universal beat. They looked poetic, almost as if they had a mind of their own. The robot decided to draw these on the terrain, but this time, the dots looked like they were coming to life and his robotic brain seemed to tell him that they were more than that, that they were full of energy. Robby then used his ruler hand to measure the distance between them in cm and saw that they had a pattern: they always went up by 10cm. With his finger, which drew in the sand, Robby connected the dots together and a variety of shapes popped up. After he had examined them thoroughly he realized that they weren't just random, they created a drawing. It was really weird, Robby felt like those little dots were trying to reach out to him or give him a hint that he needed to follow. But he wasn't catching onto it... The robot felt helpless, the little gears in his brain weren't shifting, he couldn't understand what they wanted to tell him.



After what seemed ages the cyborg finally got it. He realized that they were showing him the same image as the being in the flying container. Robby now had to make his friend in Martian life, so he thought and he thought until...“That's it!”, he shouted out loud and started collecting lots of powder from the ground. Robby wanted to make his companion from sand, but it would not be possible since it would just crumble and get blown away from the strong wind. His very first idea was a failure, but then he thought of something fascinating: 2d shapes are flat, they only have a perimeter and an area, while 3d shapes have both and a volume... Robby looked at his body and at his hands, made of brass. He then observed his surrounding and saw all of these broken pieces of metal...The cyborg knew why his planet was full of these objects, it was due to the unpredictable fall of two different rovers. One had crashed earlier than the another, the 'Mariner 8', where it's name was displayed on the lower bit of one of the metal parts, while the second one 'Kosmos 419', arrived a day later. The automaton realised that from these scraps, he could make his friend! Robby carried all the pieces that he thought he needed and started working. He measured every single length, width and breadth he could find until he was exhausted. The robot gathered 4 cuboids for the legs, 4 trapezoidal prisms for the feet, 2 cones for the ear, 1 cone for the tail, 2 (the roundest ones he could find) for the eyes, 1 bigger cuboid for the long body and finally 2 cuboids of the same length for the bottom and top part of the snout.



Robby needed to calculate the volume of each shape he had collected because he would need to work out 10% of all of them put together. He would do this because he needed to know how much oil he would have to give to his friend in order to make him live. So the robot started off by calculating the volume of the trapezoid prisms (the formula being: $\frac{1}{2} (b_1+b_2) \times h \times L$). The smaller base measured 3cm and the bigger one 6cm, the length measured 5cm and the height 2cm. Robby started off by adding the two bases, which made 9cm. He then multiplied that by 2 which was 18cm and multiplied that again by 5 which is 90cm, he divided the answer by 2 which gave him 45cm^3 . And because there would have to be 4 feet, he did 45×4 which gave him 180cm^3 . Now he had to calculate the volume of the spheres (the formula being: $\frac{4}{3}$ times pi times radius cubed). The cyborg measured the radius, he did this by measuring the sphere from its centre to its edge and it gave him 2cm. He started by dividing 4 by 3 which gave him 1.3 recurring and then multiplied that with pi which gave him 4.2 (to 1d.p.). He then cubed 2 which gave him 8 and then multiplied that with 4.2 which gave him 33.6cm^3 . Finally he timesed that by the number of eyes (two) and got the final answer 67.2cm^3 . But Robby still had a lot to do, he now needed to calculate the three cones. The formula was pi times r squared times h divided by 3. And because he had all the measurements, the height being 6cm and radius being 3cm, he was ready to carry on. Robby firstly squared 3 which made 9 and then multiplied it with pi. That gave him 28.3 (to 1d.p.). He then divided this by 3 which was 9.4 (to 1d.p.).



Then he multiplied it with the height (6cm) which finally gave him 56.6cm^3 . Lastly, the robot had to multiply that by 3 (since the being would have three cones) which gave him 169.8cm^3 . Robby's idea was perfect, it had everything he had imagined and he finally felt relieved, he had hope for the idea he had imagined, and he was so ready to create it. The last thing missing was the two rectangular prisms for the snout, the four rectangular prisms for the legs and a bigger rectangular prism for the body. He started off with the two rectangular prisms first: the height was 6cm, the length was 4cm and the width was 4cm. The robot then multiplied them together which gave him 96cm^3 and finally he timesed that by 2 which gave him 192cm^3 . Now Robby had to calculate the four rectangular prisms and their width was 2cm, height 10cm and length 4cm. The robot multiplied the 2 and 10 together which gave him 20 and then timesed that by 4 which gave him 80cm^3 . Then the robot multiplied that by 4 (because the friend would have four legs) which gave him 320cm^3 . Finally, Robby had to calculate the bigger rectangle which was the body of the animal and the height of it was 8cm, length 4cm and width 12. He multiplied those numbers together which gave him the total of 384cm^3 . All he had to do now was add all of the shapes up: $384 + 320 + 192 + 169.8 + 67.2 + 180 = 1313\text{cm}^3$.

Formula Volume: $\frac{1}{2} (b_1+b_2) \times h \times L$

$6+3=9\text{cm}$
 $9 \times 5 = 45\text{cm}$
 $45 \times 2 = 90\text{cm}$
 $90 \div 2 = 45\text{cm}^3$
 $45\text{cm}^3 \times 4$ (number of feet)
 180cm^3

Formula Sphere: $\frac{3}{4} \pi r^3$

$\frac{3}{4} = 1.3r$
 $1.33 \times \pi = 4.2$ (to 1 d.p.)
 $2^3 = 2 \times 2 \times 2 = 8$
 $8 \times 4.2 = 33.6\text{cm}^3$
 $33.6\text{cm}^3 \times 2$ (number of eyes)
 67.2cm^3

Formula Cone: $\pi r^2 \frac{h}{3}$

$3^2 = 9$
 $9 \times \pi = 28.3$ (to 1 d.p.)
 $\frac{6}{h} = 2\text{cm}$
 $28.3 \times 2 = 56.6\text{cm}^3$
 $56.6\text{cm}^3 \times 3$ (number of ears and tail)
 169.8cm^3

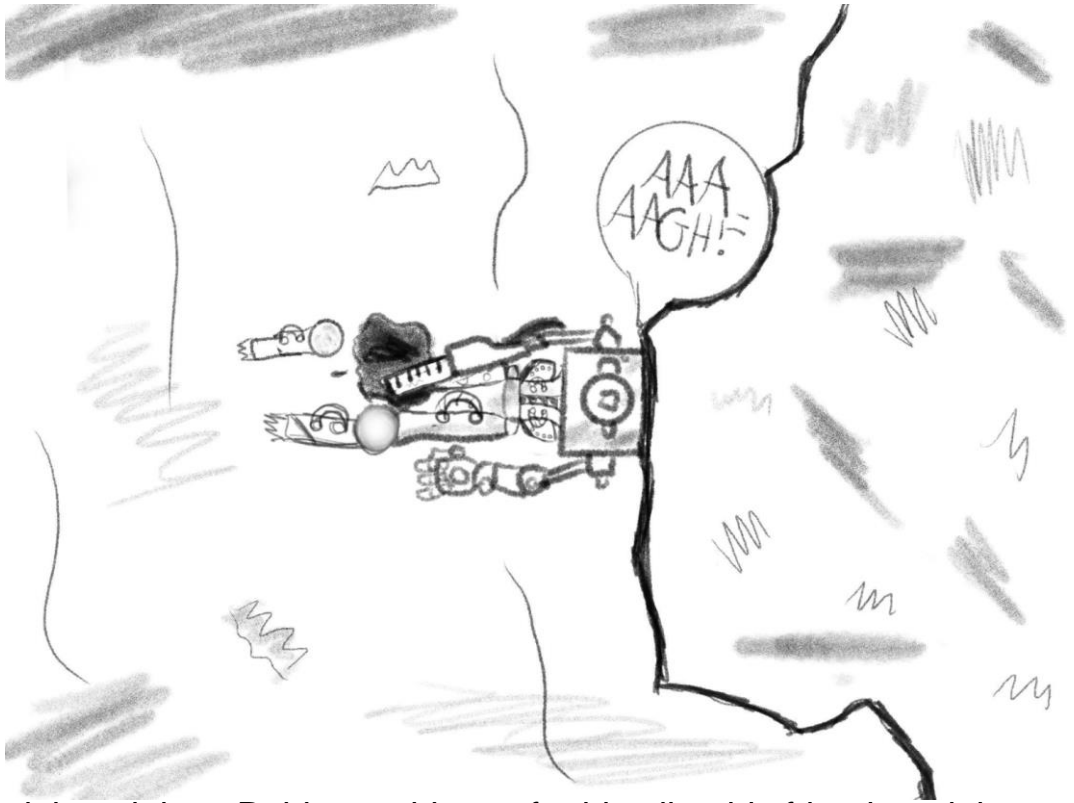
$4 \times 4 = 16\text{cm}$
 $16 \times 6 = 96\text{cm}^3$
 96×2 (lower part + higher part of snout)
 192cm^3

$10 \times 4 = 40\text{cm}$
 $40 \times 2 = 80\text{cm}^3$
 80×4 (number of legs)
 320cm^3

Body of Animal

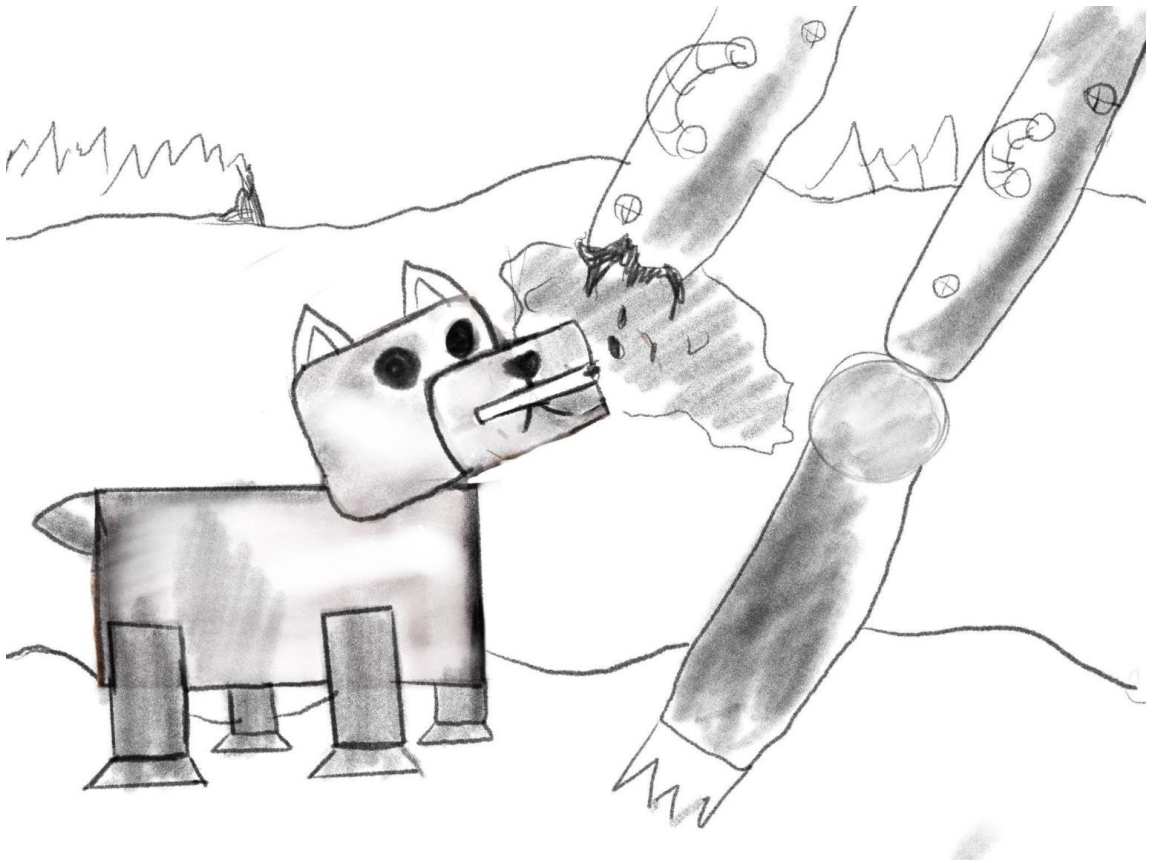
$8 \times 4 = 32$
 $32 \times 12 = 384\text{cm}^3$

Now he had to assemble the pieces, but he didn't know how to... Suddenly, a weird feeling was in his eyes, like an itch or a burn, and then a red beam came out of his irises! Robby discovered that he could shoot hot lasers, and this could be a perfect way to assemble his friend together. So he inflamed all the pieces and attached them together. And after so many years he finally felt like one of the 'Infinite Suns', sparkling and illuminating brightly. But the last thing to do was to fill 10% of his friend with 131.3cm^3 oil. The robot already had done the calculations: his body had 2000ml of oil, so he had to subtract 131.3 which made 1868.7ml.

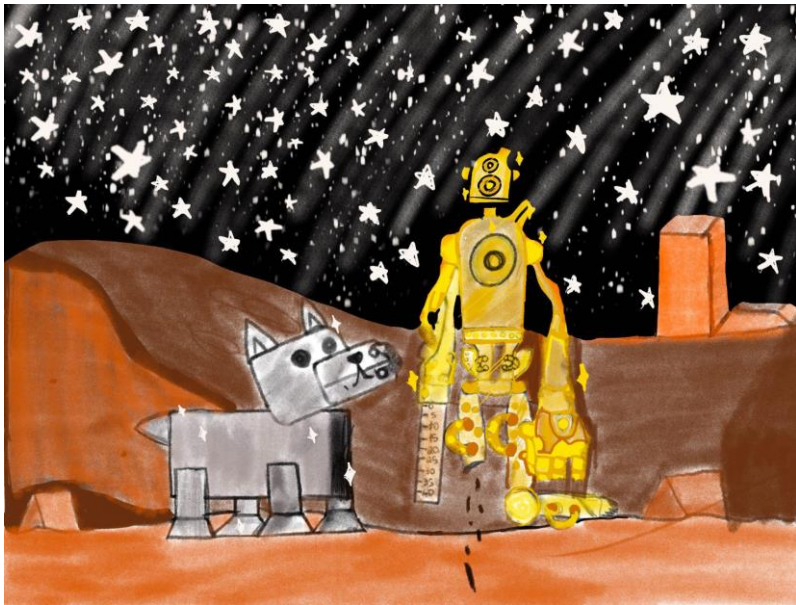


You might ask how Robby could transfer his oil to his friend, and the answer was tough to accept, he had to cut off one of his legs with his ruler hand, because it had exactly 131.3ml of oily liquid in it. With a lot of hesitation he chopped it off, he screamed in pain and put the fluid in the creature's snout, but it wasn't enough, the being wasn't waking up, and Robby was running out of lubricant in his body! He had done his calculations wrong: like any other machine, oil gets consumed and he didn't have those 131.3mm of oil in his leg, he had less!

The last choice he decided to make was to grab the friend he had just built, and put it next to his leg, so that if he would die, it could drink the oil coming out. It was too late to hesitate, his fate had been chosen, he felt the same greasy tear slowly rush down his cheek and he saw darkness... And then it happened, slowly, the robotic animal's eyes started opening, it got up and walked around, trying to understand where he was, but then he turned to his right and saw something horrifying. 'Woof!' barked the being. But it quickly realized that its creator was injured... The mechanical animal's first instinct was to try to wake Robby up, by licking his face and pushing him with his snout. Then the being noticed the substance that was coming out of the robot's leg and it felt something strange, it felt anxious, it felt like it had to do something, so then it started searching for the liquid. It travelled around this unknown world, searching and sniffing for what he needed. The robot dog was about to give up, until it found a weird piece of metal, a piece from the rover and inside it, it had the liquid he was searching for!



It took a while for it to open: the robot dog tried scratching it and tried to bite it, it even tried to jump on it, but the object didn't budge. But the being saw a little hole and it gave it a bite, and to its surprise it opened! The robot dog carried the liquid in its mouth and after hours of walking, the animal finally found his owner. Quickly, it inserted the oil in the automaton's mouth. Its heart was in its throat, the automaton wasn't opening his eyes... But then just when the little beast thought that its plan didn't work, it heard a small movement and its creator started waking up! Robby, the Martian, looked around, and on top of him, there was the cute creature, he created! And from that moment forward, it seemed as if he was seeing the world with different eyes, everything felt more colourful and vivid. The oil in his heart started pumping from the excitement and joy that he was currently feeling... But in that moment, he only thought about his saviour, of how he gave birth to his friend and his friend gave that back by saving him. Robby's mind was exploding with gratefulness and delight. After that, Robby looked down to his leg and noticed that the wound was still open, so he used his laser eyes to weld his injury and stop the oil from coming out. Like this the cyborg thought of how he had more things to do, like give his friend a name! After a lot of time pondering, he looked up at the sky and saw the beautiful 'Infinite Suns' and suddenly he felt the same feeling of communication he had sensed the first time he saw his friend....



And then he knew perfectly what name he should give his friend, a name that he didn't know the meaning of, 'Star'. Seized by the uncontrollable euphoria, Robby thought of making a reminder of what his mate was called, something decorative for her, something that when he looked at, reminded him of her. He remembered what he thought about when he first pondered of that name, he looked at the 'Infinite Suns' up in the sky, illuminating and smiling brightly. So the robot stared at them carefully, examining the shape of them, and he realised that they looked like five triangles with a pentagon placed in the middle of it. He asked himself "How could I possibly put these 'Infinite Suns' on my Star? They are so far away from us!" Hearing himself say "us" made his heart explode of joy, it finally meant there was someone who could be there for him, they were finally connected together. And then the idea snapped, he could use the scraps he had collected to build her an 'Infinite Sun'. So he grabbed the spare pieces and made five little triangles with his laser eyes. Now all Robby had to do was make a pentagon in the middle. For this he made a trapezium and stuck an isosceles triangle below it. Then, he rubbed his ruler hand on the triangles and pentagon to make friction and heat every shape up. He used his ruler hand instead of the laser eyes because the shape would've got stuck on his hand and he wouldn't have been able to place it on Star. Now that the figures were warm, he could easily stick them together and told her "This will burn a little!".... Then applied the five triangles and the pentagon onto Star's chest. She looked at her medal in a charmed way, began

wagging her tail and jumped on his legs, Robby kneeled down and her Star started licking his face with joy. He thought to himself happily: "My emptiness has finally been filled..."

