

ON YOUR MARKS, GET SET... DRONE!

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HEY THERE! **WILLIAM** FROM **INFINITY LAND SURVEYING** HERE, WITH MY GOOD FRIEND **NORMA** -- THE ASSISTANT RESCUE COW! WE'RE OVER THE MOOOON TO HEAR YOU'VE BEEN LOOKING AT THE GET KIDS INTO SURVEY **SMART CITIES** EXPLORATION POSTER -- WHAT A BUZZ! IT'S SO NICE TO BE IN THE CITY; YOU CAN USUALLY FIND US ON MUCH TOUGHER TERRAIN -- DOING RUGGED FIELD WORK TO SUPPORT AIRLINES AND PILOTS WITH THEIR GROUND CONTROL. BUT THERE'S A PARTICULAR KIND OF FLYING THAT WE ENJOY, WHICH HAPPENS TO BE TAKING PLACE RIGHT HERE IN THE SMART CITY... **DRONE FLIGHT!** CAN YOU SPOT OUR DRONE SOARING BETWEEN THE SKYSCRAPERS?

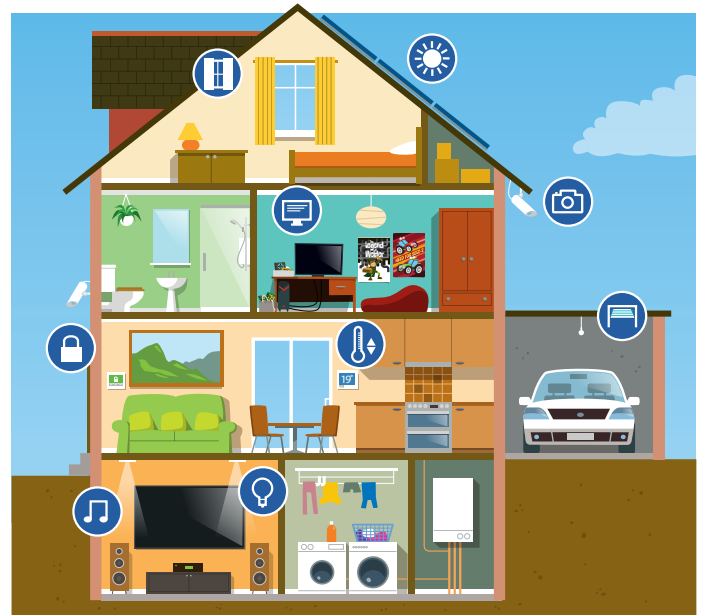
TASK 1: SMART CITIES & CLEVER HOUSES

(COMPUTING LINKS - NETWORKING AND SAFE DEVICE USE)

A smart city is an urban area that uses a network of connected devices (called an 'internet of things') to collect information, which is used to help the city run more efficiently. This is called 'urban flow'. Efforts to improve urban flow might include utilities (like power and water), transport, waste management, crime prevention and healthcare provision.

A smart city will depend on high speed, reliable data connections, such as 5G and fibre optic lines. To help you understand how different devices play a role in improving the flow of an urban environment, you might look at a modern 'smart home' as a miniaturised version of a 'smart city'.

For your first task, see if you can identify all the devices that are connected in this house. If you can, try to add some of your own; think about all the technology in your house that connects to the internet.



| PROBLEM | DESCRIPTION |
|-----------------------------|--|
| Bird collisions | Massive skyscrapers with reflective windows pose a big problem for birds, who cannot see the glass, and can be injured or killed if they fly into it. |
| Home invasions | As urban areas expand into nature, animals will come into contact with people - many of whom will try to harm or kill an animal who finds its way into their home. |
| Transport fatalities | Busy urban roads are a hazard for animals - who don't know how to cross safely like you do. Many animals are hit by moving vehicles when trying to cross. |
| Food reduction | Fewer resources are left for animals when cities get bigger. Most animal populations struggle to survive on less food or water. |

TASK 2:

PROTECTING LIFE IN THE URBAN JUNGLE

(GEOGRAPHY OBJECTIVES - LOCATIONAL KNOWLEDGE & GEOGRAPHICAL KNOWLEDGE)

As well as helping planes and pilots travel the skies safely, Infinity Land Surveying works with Ducks Unlimited and New Mexico State Game and Fish Dept. - teaming up to take care of areas where waterfowl migrate. But it's not just the great outdoors where you'll find all kinds of animal inhabitants. Some species are able to thrive in urban areas: squirrels, badgers, foxes, monkeys, birds and insects, amongst other creatures, live happily in cities all around the world. You've probably spotted a few feathered, finned and tentacle-flailing animal inhabitants in the Smart Cities exploration poster! However, when cities expand, the animal population can suffer. It's important for surveyors and developers to think about this when planning and building smart cities - and maybe you can help them!

Take a look at the problems in the table. Could you think of some solutions that surveyors and developers could put in place to protect urban wildlife?



TASK 3: DRAW-A-DRONE

(COMPUTING LINKS - EVALUATING TECHNOLOGY / DESIGN TECHNOLOGY - DESIGNING AND EVALUATION)

We're always excited by the latest drone tech at Infinity Surveying! Can you spot the sleek survey drone in the SmartCities Exploration Poster? (Hint: the answer to Question 7 might help!)

Drones, or **UAVs** (unmanned aerial vehicles) are used by surveyors and engineers to measure the earth's surface from the sky. They can be fitted with LiDAR scanners, photography equipment or video cameras, so that they can take measurements from above. This provides a new and useful perspective that helps in the analysis of areas which might be difficult to access, such as busy cities and built-up urban areas, as well as the more remote places where we like to hang out! The fastest drones in the world - like the DRL Racer X - can go from zero to 90mph in under a second, and some drones can reach speeds of over 160mph! The strongest UAVs, such as the Griff 300, can carry up to 500lbs of weight - as much as a full-grown grizzly bear!

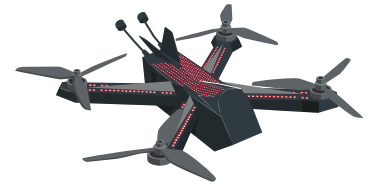
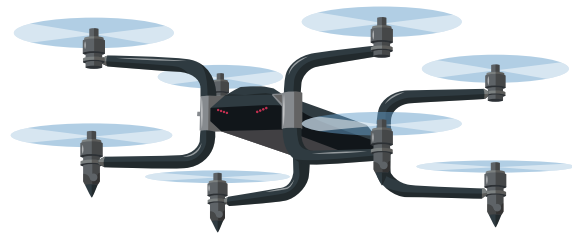
Companies like Amazon are already testing out drones as a way to deliver orders to customers. Not only that, these drones will be **autonomous** - meaning they won't need a human pilot. They'll use satellite navigation, as well as information from visual, thermal and ultrasonic sensors. For this task, imagine what the drone of the near future will look like. Combine the speed of the DRL Racer X and the strength of the Griff 300 to design the ultimate do-anything, go-anywhere drone! You could even look at our dream drone for design inspiration: the DJI Inspire 2! *swoons!*

TASK 5: IT'S BUSINESS TIME

(LITERACY LINKS - PERSUASIVE WRITING / COMPUTING LINKS - MEDIA PRODUCTION)

So, you've got a cutting edge drone design, and you've got sky-tearing performance - now it's time to join forces with Infinity Land Surveying and help me and Norma mooove from the great outdoors to the busy city! We are thinking about expanding our work from rough terrain to city streets - from hard-hiking hills to shiny skyscrapers - and we need your help to let people know that Infinity Land Surveying is coming to town!

Can you create an advert that could be projected onto skyscrapers and plastered on billboards? It could include me and Norma, as well as your super-slick drone. Use your best persuasive language skills to advertise the speed and reliability of the super drones that will whisk round the city and collect data in record time! Use what you have learned in the previous tasks about smart cities, fast data connections, and the devices of the near future to convince customers that our superior drones can serve their data needs all the way to infinity... and even further than that!



TASK 4: FLIGHT COMMANDER

(GEOGRAPHY OBJECTIVES - LOCATIONAL KNOWLEDGE & GEOGRAPHICAL KNOWLEDGE AND FIELDWORK / MATHS LINKS - USE OF SIMPLE FORMULAE)

The ultimate drone that you have designed has a top speed of 160mph, and can carry just about anything that your average customer might order. To really impress, work out some speedy delivery times using an online map site. Decide on a base for your business (this could be a nearby mail depot, an airport, an industrial estate, or even your own house!), then pick five delivery targets. Find out the distance from the base to the target using the map site, then use this formula to work out how long it would take your drone to deliver a package to the target:

$$\text{TIME} = \text{DISTANCE} \div \text{SPEED}$$

Here's an example to help:

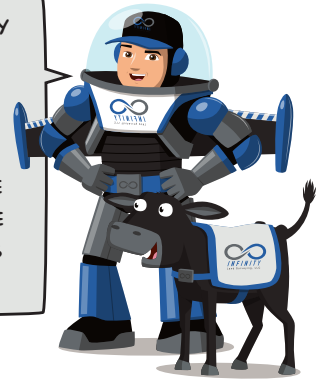
My base is Manchester Airport, and my customer is staying in the Shard building in London, a distance of 157 miles as the crow flies. The top speed of my super drone is 160mph. So, $157 \text{ miles} \div 160 \text{ mph} = 0.98125 \text{ h}$, or 58 minutes, 53 seconds!

As a final challenge, work out how long it would take your super-powered drone to reach the northernmost and southernmost points of your country!












ON YOUR MARKS, GET SET... DRONE!

FOR YOUR FIRST TASK, SEE IF YOU CAN IDENTIFY ALL THE DEVICES THAT ARE CONNECTED IN MY HOUSE, AND THEIR FUNCTION AS PART OF A SMART HOME! YOU CAN USE THE ICONS TO HELP -- THE FIRST ONE HAS BEEN DONE FOR YOU. THEN, IF YOU CAN, TRY TO THINK OF SOME OF ITEMS OF YOUR OWN; THINK ABOUT ALL THE TECHNOLOGY IN YOUR HOUSE THAT CONNECTS TO OTHER DEVICES, AND TO THE INTERNET.

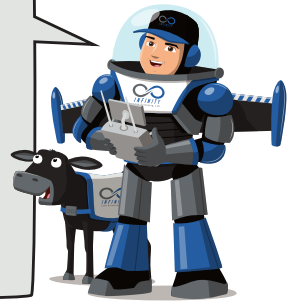


TASK 1: SMART CITIES AND CLEVER HOUSES

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|---|--------------|---|
|  | SOLAR PANELS | COLLECT THE SUN'S ENERGY SO THAT IT CAN BE CONVERTED INTO ELECTRICITY |
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ON YOUR MARKS, GET SET... DRONE!

FOR YOUR THIRD TASK, IMAGINE WHAT THE DRONE OF THE NEAR FUTURE WILL LOOK LIKE. COMBINE THE SPEED OF THE DRL RACER X AND THE STRENGTH OF THE GRIFF 300 TO DESIGN THE ULTIMATE DO-ANYTHING, GO-ANYWHERE DRONE! YOU COULD EVEN LOOK AT OUR DREAM DRONE FOR DESIGN INSPIRATION: THE DJI INSPIRE 2! *SWOONS!* DRAW A LINE FROM THE ANNOTATION BOXES TO THE KEY FEATURES OF YOUR DRONE, AND FILL THEM WITH EXTRA INFORMATION ABOUT THE SPECIAL ELEMENTS IN YOUR CONCEPT.



TASK 3: DRAW-A-DRONE



TASK 4: FLIGHT COMMANDER



Work out some speedy delivery times using an online map site. Decide on a base for your business, then pick five delivery targets. Find out the distance from the base to the target, then use the $\text{Time} = \text{Distance} \div \text{Speed}$ formula to work out how long it would take your drone to deliver a package to the target. Use the example on the learning page to help!

| BASE LOCATION | DELIVERY TARGET | DISTANCE | SPEED | TIME (DISTANCE \div SPEED) |
|---------------|-----------------|----------|-------|---------------------------------|
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FINAL CHALLENGE: Work out how long it would take your super-powered drone to reach the northernmost and southernmost points of your country!