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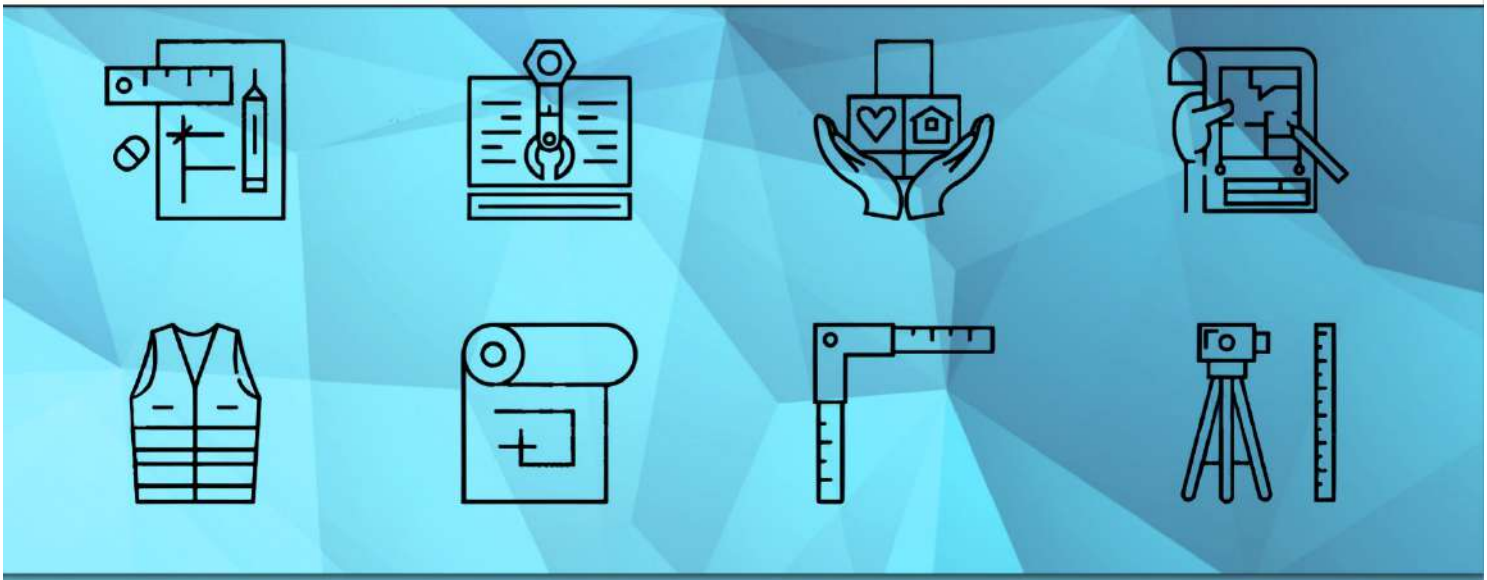
ENGLISH FOR EARTH SCIENCES AND LAND MANAGEMENT



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Навчальний посібник з дисципліни
«Іноземна мова за професійним спрямуванням (англійська)»
для здобувачів вищої освіти зі спеціальності
193 «Геодезія та землеустрій»

Запоріжжя
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Таврійського державного агротехнологічного університету
імені Дмитра Моторного
як навчальний посібник для здобувачів ступеня вищої освіти
«Бакалавр» зі спеціальності 193 «Геодезія та землеустрій»
У закладах вищої освіти III – IV рівня акредитації
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Навчальний посібник призначено для вивчення курсу «Іноземна мова (англійська) за професійним спрямуванням» здобувачами вищої освіти зі спеціальності 193 «Геодезія та землеустрій». Посібник створено з метою розвитку граматичних та лексичних навичок, практичних умінь (говоріння та письма) та навичок розуміння професійно спрямованої літератури англійською мовою. Рекомендовано як для проведення аудиторної, так і для позааудиторної, самостійної роботи, у тому числі під час дистанційної та змішаної форми навчання у закладах вищої та передвищої освіти.

CONTENTS

ПЕРЕДМОВА

Навчальний посібник «English for Earth Sciences and Land Management» призначено для вивчення курсу «Іноземна мова за професійним спрямуванням (англійська)» здобувачами вищої освіти спеціальності 193 «Геодезія та землеустрій».

Посібник створено з метою удосконалення набутих на попередньому етапі вивчення англійської мови граматичних, лексичних та письмових навичок студентів, навичок аудіювання та говоріння, розвитку практичних умінь, необхідних для активної взаємодії в академічному колі та серед фахівців.

Навчальний посібник складається з восьми розділів та двадцяти чотирьох підрозділів, що дають можливість опанувати фахову лексику та розширити знання з основ геодезії та землеустрою. Джерелом інформації стали сучасні матеріали, запропоновані провідними фахівцями з геодезії та землеустрою, у тому числі матеріали онлайн-видань та державних установ країн світу.

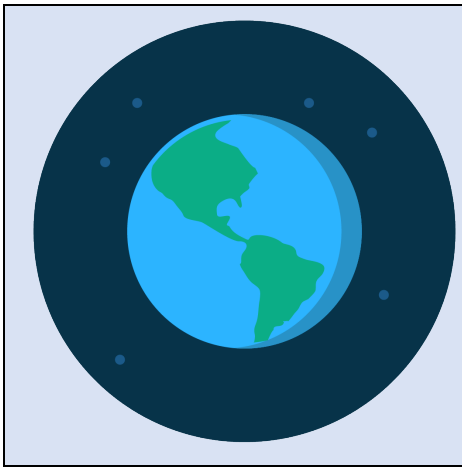
Навчальний посібник «English for Earth Sciences and Land Management» можна використовувати як для проведення аудиторної, так і для позааудиторної, самостійної роботи, у тому числі під час дистанційної та змішаної форми навчання у закладах вищої та передвищої освіти.

Автори навчального посібника гарантують збереження авторських прав щодо всіх запозичених з відкритих джерел матеріалів та не претендують на їх авторство, наголошуючи на використанні цих матеріалів виключно у навчальних цілях.

UNIT 1. THE EARTH

1.1 PLANET EARTH

1 Read the article and complete the EARTH fact file.



Earth

Distance from the Sun _____

Diameter _____

Mass _____

Shape _____

Satellite _____

Orbit _____

Rotation _____

Earth is the only known planet in the universe where the life exists. There are eight planets in our solar system and the Earth is one of them. It is more than 150 million kilometers (about 93 million miles) away from the sun. Earth is the 3d planet, after such planets as Mercury and Venus [4].

Earth is the largest and most massive of the rocky inner planet. Its mass is about 5.97×1024 kilograms (6.58×1021 tons). It is interesting to know that the Earth's diameter is almost 12,700 kilometers (7,900 miles). In comparison, Jupiter, which is the biggest planet in the solar system, weights about 1,898×1024 kilograms (2093×1021 tons) and its diameter is approximately 143 thousand kilometers (that is almost 89 thousand miles) [4].

Earth has a form of an oblate spheroid. In other words it isn't round, but it rather has spherical shape. The radius of the Earth is greater at an imaginary line running horizontally around its middle, which is called the Equator. In order to calculate the accurate location of the object on the surface of the planet or to describe its model shape, the geoid is used.

The Earth has got one natural satellite, that is the Moon. In contrast, Mercury and Venus do not have any moons, while Saturn and Jupiter each has ten and even more moons [4].

Rotation

Earth is a rocky inner planet that always moves around the sun. The track of this movement is called an orbit. Every year the Earth and its satellite the Moon go a slightly oval-shaped orbit around the sun. Earth has an axis, that is a vertical line, which runs from the North Pole to the South Pole. Earth makes one absolute rotation every twenty-four hours [4].

The rotation of the Earth leads to the day and night change, light and darkness periods. When the Earth's faces the sun, this part of the planet is in daylight; while the opposite part is in darkness. If the Earth didn't rotate, one-half of the Earth would always be extremely hot to support life, and the other half will be frosty. Earth rotates from west to east, that's why the sun rises in the east and sets in the western part of the planet [4].

2 Mark the following sentences as True (T) or False (F).

1. The Earth is about 160 million kilometers from the sun.
2. Jupiter is smaller than the Earth.
3. Earth is perfectly round.
4. Earth's axis is vertical.
5. Earth rotates from west to east.

3 Read the second part of the article and answer the questions.

Planet Earth: Interior

Earth's interior is a complex structure of superheated rocks. Most geologists distinguish three major layers: the dense core, the bulky mantle, and the brittle crust.

Earth’s core is mainly made of iron and nickel. It is composed of a solid center surrounded by an outer layer of liquid. The core is discovered about 2,900 kilometers (1,802 miles) below Earth’s surface, and it has a radius of about 3,485 kilometers (2,165 miles) [4].

The core is surrounded heavy mantle rocks (mainly of silicates). The mantle has a thickness of about 2900 kilometers (1802 miles) and is a whopping 84% of the total volume of the Earth. The mantle’s molten rock is constantly in motion. Parts of the mantle are molten, ie they consist of partially molten rock. The molten mantle rock is constantly in motion. It comes to the surface during volcanic eruptions and at mid-ocean ridges [4].

The Earth's crust is the thinnest layer on the planet, and it is only 1% of the Earth’s mass. The scientists name two kinds of crust: thin, dense oceanic crust and thick, less-dense continental crust. Oceanic crust extends approximately 5 to 10 kilometers (3 to 6 miles) beneath the ocean. And its thickness is from 35 to 70 kilometers (from 22 to 44 miles) [4].

Exterior: Tectonic Activity

The crust is covered with a number of constantly moving tectonic plates. New crust is formed along mid-ocean ridges and rift valleys, where the plates separate from each other in a process called rupture. The plates slide on top of each other in a process called subduction. They collide with each other in a process called faulting [4].

Tectonic activity, such as subduction and faulting, has made the Earth's crust a variety of landscapes. Earth's highest point - Mount Everest, Nepal, which rises to 8,850 kilometers (29,035 feet) in the Himalayas in Asia. Mount Everest is growing every year because subduction moves the Indo-Australian tectonic plate under the Eurasian tectonic plate. Subduction creates the deepest point of the Earth, the Mariana Trench, about 11 kilometers (6.9 miles)

below the surface of the Pacific Ocean. A heavy Pacific plate is subdued under a small Marian plate [4].

Plate tectonics are also responsible for landforms such as geysers, earthquakes, and volcanoes. Tectonic activity around the Pacific Plate, for example, creates “Ring of Fire”. This tectonic core includes volcanoes such as Mount Fuji, Japan, and seismic fault zones such as the west coast of the United States.

1. What is the Earth’s core mostly made of?
2. What is core surrounded by?
3. What is the planet’s thinnest layer?
4. What has shaped the crust into a variety of landscapes?
5. What is “Ring of Fire”?

4 Match the words with their definitions.

1. planet 2. solar system 3. rotation 4. core 5. crust 6. mantle 7. rifting 8. subduction 9. faulting 10. tectonic plate	**a)** is the sun and all the planets that go round it. **b)** is the process when a split appears in something solid. **c)** is a large, round object in space that moves around a star. **d)** the process of one tectonic plate sliding under another, resulting in tensions and faulting in the earth's crust, with earthquakes and volcanic eruptions **e)** a large piece of the Earth's surface. **f)** is the central part of something. **g)** the process when a large crack appears in the surface of the earth. **h)** is circular movement. **i)** is a layer of it covering a surface **j)** is a hard layer of something, especially on top of a softer or wetter substance.

5 Fill in the EARTH mind map and make a short report about our planet.

1.2 THE SPHERES OF THE EARTH

1 Scan the QR-code and Watch the video.

2 Mark the sentences as True or False. Correct the false ones.

1. Our Earth is divided into four different spheres.

_____

_____

2. The geosphere is the most solid part of the Earth.

_____

_____

3. The hydrosphere makes up of two-quarters of the ground surface.

_____

_____

4. We see water in a solid form in ice and snow.

_____

_____

5. The most external part of our planet is the atmosphere.

_____

_____

6. The atmosphere is divided into two layers.

_____

_____

7. The troposphere is the most distant layer from our planet.

_____

_____

3 Watch the video again and fill in the text with missing words.

core	**temperatures**	**Earth**	**continents**
mantle	**geosphere**	**crust**	

The geosphere is the most solid part of the _____ and is divided into three separate layers: the _____, the _____ and the crust. The core is the Earth's center. It is made up of metals and its _____ are extremely high. The mantle is the _____ thickest layer. The temperature in the mantle is also very high, so high that some rocks, found there, even melts. The _____ is the external layer. It is composed of rocks and it is where the _____ are formed as well as Islands and also the seabed. So in a sense we can say it's the ground we walk on.

1.3 GRAMMAR REVIEW

Possessive forms and adjectives

Possessive adjectives	
I	my
he	his
she	her
it	its
we	our
you	your
they	their

1 Complete the sentences with *my, your, his, her, its, our, or their*.

1. I'm Tina and _____ sister's name is Jenny.
2. We're brothers. _____ names are Ben and Tom.
4. They're my colleagues. _____ names are Josh and Chelsey.
5. We work here. _____ office is fantastic.
6. He's British but _____ wife is from Ukraine.

2 Write the possessive form.

1. The computer belongs to the man.

the _____ computer

2. The laptops belong to the women.

the _____ laptops

3. The books belong to the teacher

the _____ books

4. The office belongs to my friend.

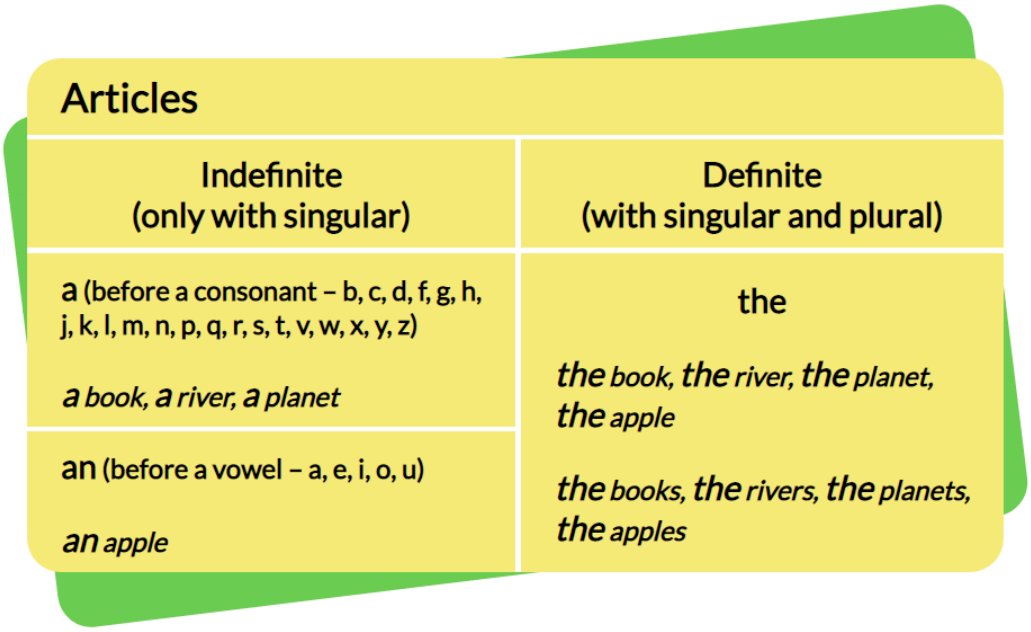
_____ office

5. The computer belongs to the girls.

_____ computer

Possessive forms	
Singular + 's	Plural + '
boy's atlas Tom's book	boys' atlas BUT Tom and Helen's book

Articles



Articles

Indefinite (only with singular)	Definite (with singular and plural)
a (before a consonant – b, c, d, f, g, h, j, k, l, m, n, p, q, r, s, t, v, w, x, y, z) *a book, a river, a planet*	the *the book, the river, the planet, the apple*
an (before a vowel – a, e, i, o, u) *an apple*	*the books, the rivers, the planets, the apples*

3 Put *a* or *an* in the gaps.

1. Geodesy is ____ useful subject.
2. It's _____ old gadget.
3. She has _____ interesting book.
4. It's _____ engineering office.
5. He's _____ Ukrainian businessman.
6. The way to work takes ____ hour.
7. There is _____ river here.
8. They want to work in ____ surveying office.
9. He works as ____ land surveyor.

4 Put *the* where necessary.

1. I have ____ breakfast at 8 a.m.
2. He finishes work late in _____ evening.
3. My favourite activity is _____ rock climbing.
4. ____ crust is one of the Earth's parts.
5. ____ Earth is our planet.

Present Simple Tense: to be

Present Simple Tense: to be

	+	−	?	
I	am / 'm	'm not	Am I ...?	Yes, I am. No, I'm not.
You	are / 're	aren't	Are you ... ?	Yes, you are. No, you aren't.
He She It	is / 's	isn't	Is he / she / it ...?	Yes, he / she / it is. No, he / she / it isn't.
We You They	are / 're	aren't	Are we / you / they ...?	Yes, we / you / they are. No, we / you / they aren't.

5 Complete the sentences with *to be*.

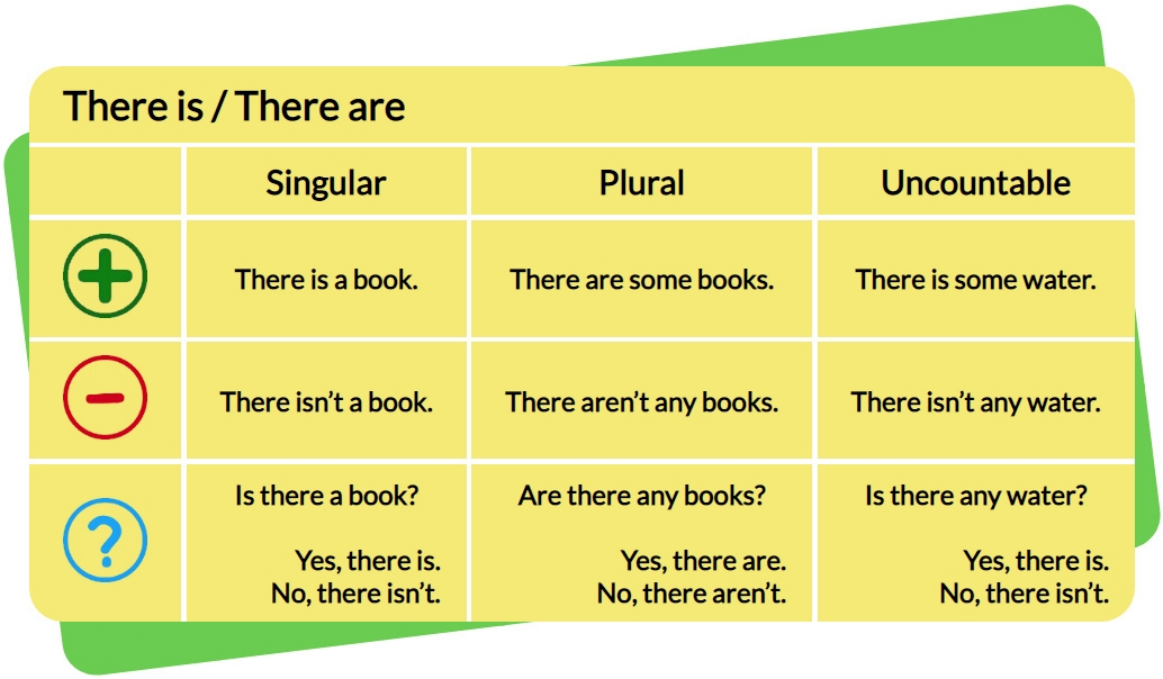
1. He / smart _____
2. They / engineers _____
3. It / cold now _____
4. You / clever _____
5. We / busy today _____
6. I /a land surveyor _____
7. She / from Kyiv _____
8. My colleagues / American _____
9. Jill and Pete / from Canada_____
10. Tim Brown / a scientist _____

6 Correct the mistakes.

1. I are fond of landscape design magazines.
2. Is you a surveyor?
3. You are an engineer or a builder?
4. They am hard-working managers.
5. Is it a map? Yes, it isn't.

6. Land are important resource.
7. Those notebooks is on my desk.
8. She am not in the office.
9. They are on the field?
10. Are they busy? No, they are.

There is / There are



There is / There are

	Singular	Plural	Uncountable
+	There is a book.	There are some books.	There is some water.
−	There isn't a book.	There aren't any books.	There isn't any water.
?	Is there a book? Yes, there is. No, there isn't.	Are there any books? Yes, there are. No, there aren't.	Is there any water? Yes, there is. No, there isn't.

7 Use *there* + *the correct form of be* to make sentences.

1. _____ a river.
2. _____ any water left.
3. _____ any mountains?
4. _____ some snow on the ground.
5. _____ a library near here?

8 Complete sentences with *some* or *any*.

1. There is _____ sand in my bag.
2. There aren't _____ any tourists in this region.
3. Is there _____ news from him?
4. There are _____ notes on the table.
5. There isn't _____ water in my bottle.

1.4 LEAFLETS

1 Have you ever written leaflets? Do you know their purpose? Check your ideas.

*A **LEAFLET** is a small sheet of printed paper that gives clearly and concisely some kind of information. Businesses use leaflets to advertise their products and services. They're often also used to let people know about new trends, special offers, events or very important social issues.*

2 Read the writing strategy. Do you find writing leaflets difficult or easy? Why?

Leaflets must

- be aimed at the right audience and for the right purpose
- look attractive and be easy to read;
- have headings with different sizes and styles of writing;
- include all the relevant facts in a logical and clear way;
- attempt to persuade the reader to do something using slogans or persuasive language;
- include illustrations to catch the readers' attention, but not too many.

Do	Don't
✓ Use illustrations ✓ Use headings + subheadings ✓ Make paragraphs	✗ Write lots of 1 sentence paragraphs ✗ Use too many bullet points

In order to persuade the audience to do something, **USE**:	
Questions	*Do you want to change your lifestyle?*
Benefits	*With determination you will quickly achieve the success*
Advice	*Try to talk to someone you trust*
Information	*Contact us on 0800 44455544455 or at www.abc.co.uk*
Reassurance	*Our story shows that everything is possible*
Understanding	*It may seem very hard at first, but ….*
Risks	*If you do nothing, things are likely to get worse*

For more detailss, check the Writing file 1

3 Put the parts of the leaflet in the right order.

Leaflet

a) Admission going on.
b) Classes start on December, 13
c) Contact : The Wisconsin University, Wisconsin - 91(HO)
d) Features : - Excellent experienced faculty
   - guaranteed results
   - reasonable course fees
   - well - equipped classroom
e) Golden opportunity for Geodesy students!
f) Hurry up and book your seat now.
g) Mobile : 0667 456 765 45
h) Opens its courses for international students!
i) The Wisconsin University

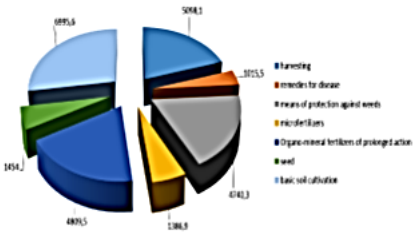
4 Look at this leaflet and say what improvements it needs.

Soil-climatic conditions of Ukraine are quite favorable for the cultivation of sugar beets that are the only source for sugar production. From the 1990s, the beet and sugar industry has been adapting to market conditions.

However, the economic crisis, which hit the economy of Ukraine and especially the agro-industrial complex, caused a sharp decline in the sugar beet cultivation. In 2015, only 238 thousand hectares of sugar beet were sown, that is 38.5% less than in 2014.

In order to bring it out of the financial, economic and social crisis and to increase economic and environmental indicators, a complex of measures should be defined and implemented.

The economic efficiency of bioadaptive technology of sugar beet production



This led to a decrease in the number of working sugar factories, sugar production volumes and, accordingly, reduction of working conditions places in both agricultural enterprises and sugar factories. In order to bring it out of the financial, economic and social crisis and to increase economic and environmental indicators, a complex of measures should be defined and implemented.

Among the main factors influencing the efficiency of sugar beet cultivation, the important place belongs to crop rotation, the observance of which enables to obtain not only high stable crops but also to control weeds, diseases and pests, to maintain optimal water and nutrition regimes of the soil. That is why recommendations for bioadaptive sugar beet production technology were developed.

Requirements for this technology are:

- application of high-yielding sugar beet hybrids;
- supply of all agrotechnological processes with material and technical means for optimum use of soil fertility, obtaining high productivity of the crop and product quality;
- ensuring a high organization of technological processes management, technological discipline and interest in the final results;
- managers and specialists with high professional knowledge;
- sufficient financial, technical, resource and technological support.

5 Compose your own leaflet on one of the proposed topics:

- We live on Earth!
- Save the Earth!
- It's our planet!
- Paradise on Earth
- Earth Day celebration
- Friends of the Earth

Steel tapes are supplied in a corrosion-resistant metal case or a leather case with a winding device. It should be handled with care, as it is a thin tool. However, its quality and accuracy is much better than the other tapes.

Peg

Pegs are mostly made of timber. They are used to mark out the locations on the ground at terminal points or the end of the survey line.

They are 2.5-3 square centimetre and are of 15 centimetre length with a tapered end.

A hammer is used to drive the peg into the ground. [15]

Ranging Rods

The rods for measuring the range are 2-3 meters long and are painted with alternating stripes of two colors: white and black, red and white in series. Each strip is 20 centimeters long.

The rods are made from well-seasoned timber. Their cross-section remains circular or octagonal with 3 cm nominal diameter.

They are used to range an intermediate point on a survey line.

A red, yellow, or white flag is tied at its top during longer shots, because the rod is not visible at a distance of more than 200 meters. [15]

Theodolite

It is the most accurate instrument for the measurement of horizontal and vertical angles. It is popular in various surveying applications.

There are two types of theodolite - transit and non-transit. Nowadays, non-transit theodolites are obsolete.

A transit theodolite is a theodolite in which the telescope can be rotated 180° in the vertical plane. [15]

A theodolite can be used to

- Measure the magnetic bearing of a line
- Measure direct and deflection angles

- Extend a straight line
- Establish a straight line between two points
- Locating point of intersection between two straight lines
- Setting out a horizontal angle
- Setting out an angle by repetition
- Establish grade
- Measure the difference in elevation
- Setting out curves

Total Station

It is an electronic transit theodolite with an electronic distance meter (EDM). The crosshairs on the TS reflector are aligned to the ranging rod and the vertical and horizontal angles are measured together with slope distances at the same time.

It is used to take the measurement of

1. Horizontal angles: The rotation of the optical axis of TS from the instrument north in a horizontal plane gives the horizontal angle.
2. Vertical angle: The tilt of the optical TS axis from the local vertical gives the vertical angle.
3. Slope distance: The distance between TS and target gives the slope distance.

The TS can also store data as some of them have a built-in electronic data warehouse that can be uploaded to the computer, and the data analysis can be performed using various applications. [15]

Levelling Staff

This is a straight rod with a zero mark at the bottom. This helps determine how high or low the station is from the line of sight.

Surveying instrument	Specific characteristics	Usage
Measuring Tape	It is made up of cotton, coated linen, metal, steel or any other synthetic material	To measure the distance

3 Read the article again and mark following statements as True (T) or False (F). Correct the false ones.

1. Ranging rods are used to mark out the locations on the ground at terminal points or the end of the survey line.

_____

_____

2. Ranging rods are made of well-seasoned timber.

_____

_____

3. Non-transit theodolites are widely used these days.

_____

_____

4. Measuring tape is used for setting out an angle by repetition.

_____

_____

5. Total station is an electronic transit theodolite with an electronic distance meter (EDM).

_____

_____

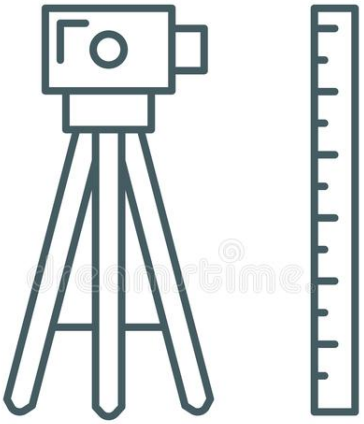
6. Levelling staff helps in determining how much above or below is the station from the line of sight.

_____

_____

4.2 SURVEYING 1 – INTRODUCTION TO LEVELING

1 Scan the QR-code and Watch the video.



2 Mark the sentences as True or False. Correct the false ones.

1. The tripod legs have to be placed firmly in the ground.

_____

_____

2. We don't have to use the levelling screws to level it on the dome top.

_____

_____

3. We bring the bubble adjacent to the centre of the circle.

_____

_____

4. The automatic level isn't a sensitive piece of equipment which doesn't need to be cared for.

_____

_____

5. When setting up the level, ideally you will set it up at eye-height.

_____

_____

6. When moving around the instrument, you should place pressure or put your weight on the tripod legs.

_____

_____

3 Watch the video again and fill in the text with missing words.

setup	**components**	**types**	**level**	**tripod**	**automatic**

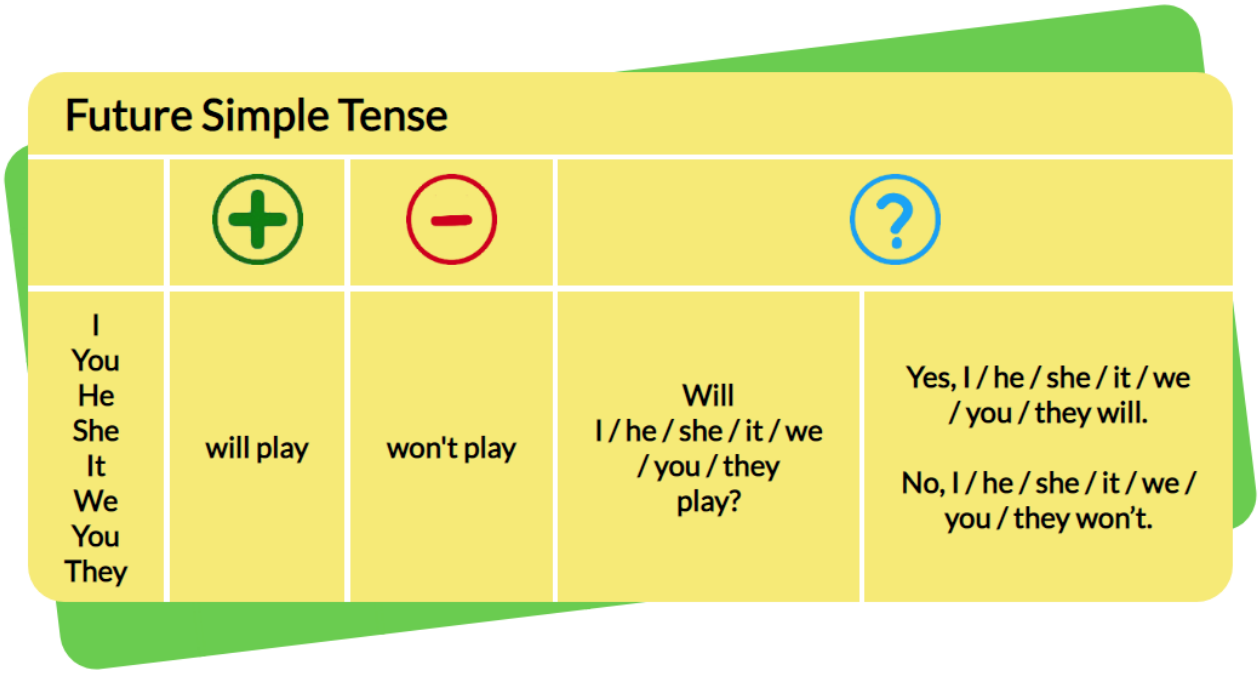
The automatic _____ is one levelling instrument used on a building site. And there's basically three _____ in its use. There's the automatic level itself, the _____ on which it sits, and when we take a reading, that's to the staff.

I'm now going to demonstrate the _____ of the level and first we're going to place the tripod.

Tripods come in two _____. Firstly, there's this one, the dome top. And there's also a flat top. With the _____ level, we generally use a dome top tripod.

4.3 GRAMMAR REVIEW

Future Simple Tense



1 Write sentences with *will* and the words in brackets. Then make them negative.

1. We / finish the project / next week.

_____

2. They / stake out boundaries / next month.

_____

3. I think / he / finish / plot description / today.

_____

4. Perhaps, Tina / prepare a final report / tomorrow.

_____

5. We / perform the boundary survey / in May.

_____

Be going to

Be going to

	+	−	?	
I	am going to play	'm not going to play	Am I going to play?	Yes, I am. No, I'm not.
You	are going to play	aren't going to play	Are you going to play?	Yes, you are. No, you aren't.
He She It	is going to play	isn't going to play	Is he / she / it going to play?	Yes, he / she / it is. No, he / she / it isn't.
We You They	are going to play	aren't going to play	Are we / you / they going to play?	Yes, we / you / they are. No, we / you / they aren't.

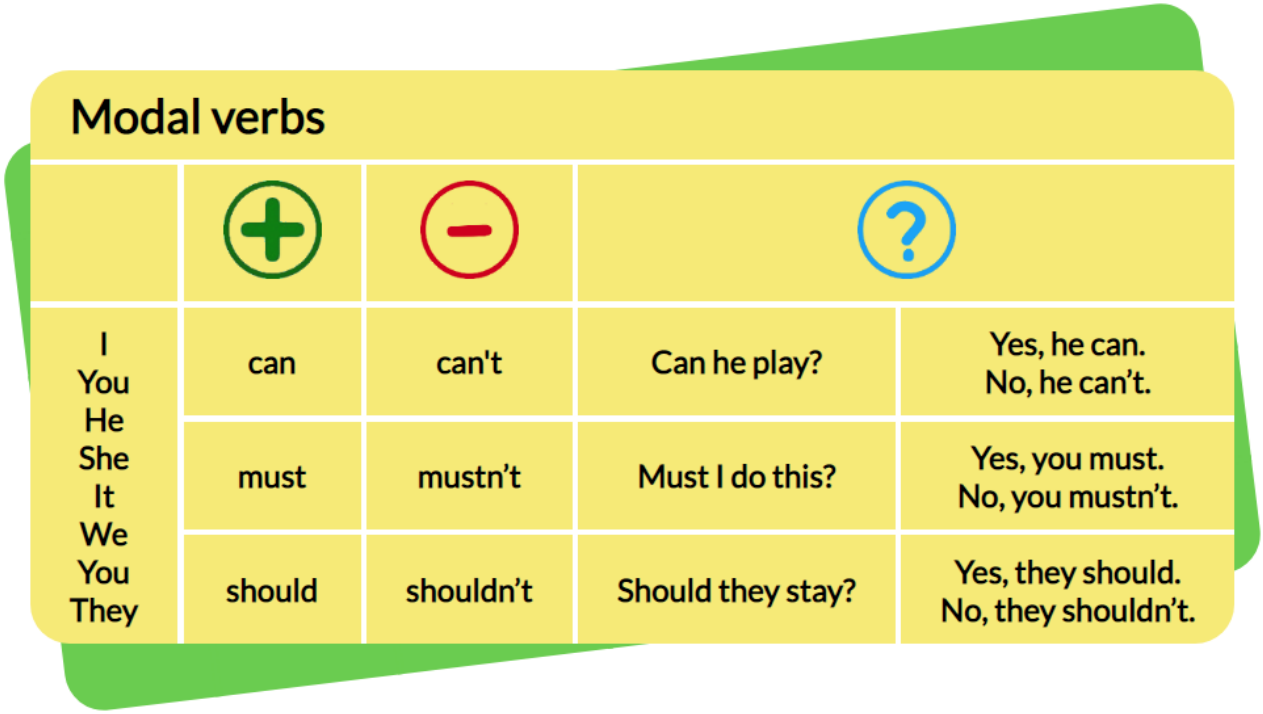
2 Complete the sentences, using *be going to* and the verbs in brackets.

1. I _____ (study) Geodesy at the university.
2. I _____ (work) for a geodetic survey agency.
3. I _____ (not travel) around the world.
4. I _____ (do) surveys.
5. I _____ (have) a land surveying license.

3 Write negative sentences using *be going to*.

1. She / see / her colleagues / tomorrow.
2. They / buy / new surveying equipment / in a month.
3. We / work hard / these days.
4. Tom / write a report/ tonight.
5. I / write /a legal description / next week.

Modal verbs



Modal verbs

	+	−	?	
I You He She It We You They	can	can't	Can he play?	Yes, he can. No, he can't.
	must	mustn't	Must I do this?	Yes, you must. No, you mustn't.
	should	shouldn't	Should they stay?	Yes, they should. No, they shouldn't.

1 Put the words in the right order.

1. speak / languages / they / can / three.

_____

2. hours / how many / they / can / work on field?

_____

3. plot / can't / descriptions / he / write.

_____

4. in / take part / can / surveyors / land use planning.

_____

5. perform / a surveyor / can /topographic surveys?

_____

2 Complete the gaps with *should* or *shouldn't*.

1. You _____ wear formal clothes when you are in the office.
2. He _____ work harder to get a promotion.

3. They _____ meet the clients to discuss the project.

4. We _____ take this equipment, it is broken.

5. Surveying equipment _____ be transported in tool boxes.

6. Surveyors _____ work under bad weather conditions.

Modal verbs: have to

	⊕	⊖	?	
I We You They	have to	don't have to	Do you have to do this?	Yes, I do. No, I don't.
He She It	has to	doesn't have to	Does he have to do this?	Yes, he does. No, he doesn't.

3 Use the correct form of *have to* to complete sentences.

1. we / do / all the tasks.
2. they / write / a work report / today.
3. he / arrive to the office / before 10 am.
4. the plan / not include / additional information.
5. I / finish / this work / by 2 pm.

4 Complete the gaps with *mustn't* or *don't (doesn't) have to*.

1. You _____ do that! It's forbidden!
2. You _____ be late for your work.
3. They _____ do their work, otherwise they will be fired.
4. He _____ write an email to them. I have already done this.
5. They _____ buy new equipment. The old one is in bad condition.

4.4 MEMO

1 Do you know what a MEMO stands for? Have you ever written or received any of them? Check your ideas.

*A **MEMO** (short for memorandum) is a business document that seeks to engage staffers inside a company and communicates important messages on key issues on meetings, company policies, and corporate business.* [5]

2 Read the writing strategy. Do you find writing memos difficult or easy? Why?

Tips for writing memos

- *Stick with the corporate policy on memos.*
- *Keep your sentences and paragraphs short and to the point.*
- *Use bullet points.*
- *Focus on the call to action. The end of the memo, where a call to action is included, is vital to the memo process.*
- *Edit for grammar.*

[17]

For more details, check the Writing file 4

Creating a memo

- **1. Add the Title** (a memo's title is short and to the point, and is always placed at the top of the page).
- **2. Make Sure to Include the Date** (the date is necessary as a time point of reference - it shows the recipient when the memo was written).
- **3. Designate Who Receives Memo With "To"** ("To" designates who receives the memo, either an entire company department or to an individual).
- **4. Make Clear Who the Memo Is "From"** (this line designates the memo's author, by name and title).
- **5. Add a Clear Subject** (this line designates what the memo is about and should always be written clearly, concisely and compellingly).
- **6. Write the Body** (this section goes into more detail on what the memo is about; the goal is to get to the point quickly).

[17]

3 Match the phrases with the part of the memo.

1. Header	**a)** As our company continues to grow, we've decided it makes more sense to separate our video production team from our content team.
2. Paragraph One	**b)** DATE
3. Paragraph Two	**c)** I'd appreciate your cooperation during this time.
	d) I'm writing to inform you …
4. Paragraph Three	**e)** I'm writing to request …
	f) Please email me with questions.
	g) SUBJECT
	h) TO / FROM

4 Complete the template with phrases from the box.

[reason for writing memo]
[main subject of the memo]
[information about the sender]
[evidence or reason to support your opening paragraph]
[day/month/year]
[official business information]
[information about the recipient]

TO: _____

FROM: _____

DATE: _____

SUBJECT: _____

I'm writing to inform you that _____.

As our company continues to grow _____.

Please let me know if you have any questions. In the meantime, I'd appreciate your cooperation as _____ takes place.

5 Imagine that you are working for the surveying company.

Your task is to send a memo to your colleagues about the work they have to do tomorrow. Use the following template.

MEMO
TO: _____
FROM: _____
DATE: _____
SUBJECT: _____
Paragraph 1 _____
Paragraph 2 _____
Paragraph 3 _____

UNIT 5. CARTOGRAPHY

5.1 THE HISTORY OF CARTOGRAPHY

1 Do you know...

- What is cartography?
- Is it still important?
- What does a cartographer do?
- Do cartographers still exist?

2 Read the article and find out more about the history of mapmaking.

A Brief History of Cartography

Creating maps date back centuries or even millennia. The oldest maps are rock paintings on walls and stone tablets, and it took hundreds of years to create a navigational (albeit distorted) projection of the world.

Regardless of the format, the history of our world's maps is extremely interesting. [2]

Ancient maps

The oldest known map of the world dates back to the 7th millennium B.C.

Thinking to depict the details and location of the Anatolian city of Çatalhöyük, this ancient map was found, painted on the wall of a cave.

It depicts a volcano and 80 buildings, 9 feet wide, and some believe it is a city plan.[19]

It should be noted that there are various interpretations of these figures. Some people believe that the "mountain" is actually leopard skin, and the squares are a cunning geometric design.

Without additional evidence, it is almost impossible to make a firm statement one way or another.[2]

However, this figure illustrates the lack of clarity in many cartographic representations. Even if it is a map, the overall fidelity is clearly low.

The increase in mapping accuracy is often attributed to Greek scientists and philosophers.

The Greeks

It is believed that the Greek philosopher Anaximander created the first published map of the world. This map has long been lost, but its reproductions are based on descriptions from secondary sources.

It is clear that the accuracy of this map was limited. However, it was one of the first known attempts to accurately depict the world as a whole. [19]

Ptolemy, another Greek, created geography by accident.

Ptolemy, who has many talents and contributed to mathematics, astrology and astronomy, was obsessed with the idea of creating accurate horoscopes. In pursuit of this goal, he developed a system of lines - latitude and longitude - on which he caused 10,000 birth locations. [19]

These efforts inadvertently laid the foundation for the cartography which we have known today.

The Era of Research

The era of research began in the 15th century, in part due to incredible inventions such as the telescope, compass and sextant.

This desire for research has caused a demand for increasingly detailed and accurate maps of the world. [2]

This era is beautifully described by the Time newspaper:

“By the middle of the 16th century, everyone needed a flat map that allowed seafarers to draw long distances using a straight line that took into account the curvature of the earth's surface.” [2]

This demand prompted European cartographers to conduct extensive land surveys, explore unexplored areas, and create the most detailed maps ever visible. It was during this era that the famous Mercator projection was created.

Maps in modern times

Maps have evolved significantly with the advancement of geospatial technologies: opening up new possibilities with the advent of Google Earth. [19]

Zhou Qiming, a professor and director of the Center for Geo-Computing Research at Baptist University of Hong Kong, speaks well of this new era:

“We are ... (finding) ways to represent geospatial locations that are not maps in the traditional sense, but rather visualized in the form of maps. Maps are getting smarter and show us a world with different parameters. " [19]

Previous mapping tools include compasses, mylar sheeting, planimeters, and dividers - all of which are used to create analog maps. As digital mapping has become more popular, modern mapping tools have changed significantly.

Modern Cartography Tools

Today's cartography tools have taken mapping to a new level, mostly in terms of detail and accuracy, and sometimes in the literal sense. [2]

Many methods and tools can be used in mapping. Here we will look at some of the most common tools: aerial photography, sensors, GPS, satellites and GIS.

3 Answer the questions, use information given in the text.

1. When did the first maps appear?
2. How old is the oldest known map?
3. Who has created the first published world map?
4. When did the Age of Exploration begin?
5. What tools were used to create analog maps?

4 Match the words with their definitions.

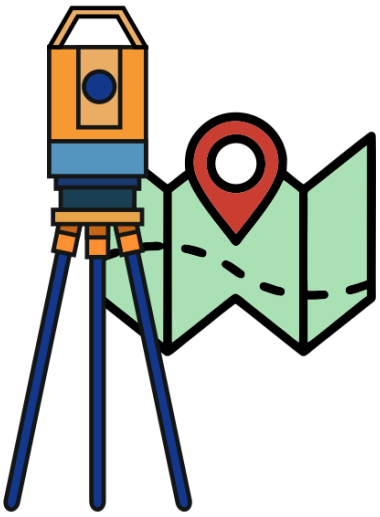
1. mapmaking 2. cartography 3. drawing 4. accuracy 5. exploration 6. geospatial 7. Mercator projection 8. compass	**a)** an organized trip into unfamiliar regions, esp for scientific purposes; expedition. **b)** is a picture made with a pencil or pen. **c)** of or relating to the relative position of things on the earth's surface. **d)** is an instrument that you use for finding directions. It has a dial and a magnetic needle that always points to the north. **e)** is the act or process of making geographical maps. **f)** an orthomorphic map projection on which parallels and meridians form a rectangular grid, scale being exaggerated with increasing distance from the equator. **g)** is the art or activity of drawing maps and geographical charts. **h)** is the quality of being true or correct, even in small details.

5 Make a short report about the one of the historical periods of cartography development.

- Ancient Cartography
- Medieval Cartography
- Cartography of the Modern Era

5.2 WHAT IS CARTOGRAPHY?

1 Scan the QR-code and Watch the video.



2 Mark the sentences as True or False.

1. Cartography is the study and practice of making maps.

_____

2. Topographical Maps focus on a particular topic or theme, like weather or statistics.

_____

3. Thematic Maps are similar to general purpose maps, but include elevation details with contour lines.

_____

4. Marine Navigation Charts are maps for the land.

_____

5. Cadastral Maps show land surveys.

_____

6. George Washington employed a surveyor in Virginia who created hundreds of maps through his life.

_____

7. The remote location and inhospitable environment make it a challenge to create maps of the arctic.

_____

3 Watch the video again and fill in the text with missing words.

navigate communicate cartographer roadmaps maps representation

Cartography is the study and practice of making _____. A map can show you how to _____ around the entire world, or just how to find the right store in a shopping mall. But because a map is a visual _____ of a place, a _____needs to be part scientist and part artist to _____ that information in the best way possible.

There are different types of maps for different purposes. General Purpose maps, like _____ call out important natural and man-made features.

5.3 GRAMMAR REVIEW

Past Simple Tense

Past Simple Tense

	+	−	?	
I You He She It We You They	played	didn't play	Did I / you / he / she / it / we / you / they play?	Yes, I / he / she / it / we / you / they did. No, I / he / she / it / we / you / they didn't.

Past Simple Tense

	+	−	?	
I You He She It We You They	went	didn't go	Did I / you / he / she / it / we / you / they go?	Yes, I / he / she / it / we / you / they did. No, I / he / she / it / we / you / they didn't.

Основний зміст листа (Body of the letter)

Його зміст залежить від тематики спілкування.

Якщо писати про новини, то використовуйте:

Glad to hear that ...

Great news about ...

Sorry to hear about ...

Якщо хочете поділитися новинами:

I thought you might be interested to hear about / know that …

Listen, did I tell you about ...? You'll never believe what

By the way, have you heard about / did you know that ...?

Oh, and another thing ... This is just to let you know that

Якщо вибачаємося:

I'm really sorry that I forgot to send you a birthday card but I was busy with my new job.

I'm writing to apologise for missing your party but I'm afraid I was with flu.

Якщо запрошуємо:

Could you let me know if you can come / you'd like to join us?

I was wondering if you'd like to come on holiday with us.

I'm / We're having a party on Saturday 13th and I / we hope you'll be able to come.

Відповідаємо на запрошення:

Thank you very much for your invitation. I'd love to come.

Thank you for inviting me to ... but I'm afraid I will not be able to...

Якщо запитуємо:

I'm writing to ask for your help / you (if you could do me) a favour.

I wonder if you could help me / do me a favour.

I'd be very / really / terribly grateful if you could

Якщо дякуємо:

I'm writing to thank you for your hospitality / the wonderful present.

It was so kind of you to invite me to stay with you.

I really appreciated all your help / advice.

Якщо вітаємо / бажаємо успіхів:

Congratulations on passing your exams / your excellent exam results!

I wish you good luck / Good luck in / with your exams / your interview.

Do not worry, I'm sure you'll do well / pass.

Якщо пропонуємо і радимо:

Why do not you ...?

Maybe you could ...?

How about ...?

You can not leave Kyiv without ... (doing sth)

I'm sure you will enjoy ... (doing sth). If you like, we can ...

Завершення листа (Closing remarks)

Звичайно ж після того, як про все розповіли, потрібно логічно закінчити лист. Для цього можете використовувати наступні традиційні фрази.

Скажіть, чому ви закінчуєте лист:

Unfortunately, I need to / have to go.

It's time to finish.

Anyway, I must go and get on with my work!

Передайте привіт або скажіть про наступну зустріч / лист:

Give my love / regards to ... / Say hello to ...

Anyway, do not forget to let me know the dates of the party.

We must try and meet up soon.

I can not wait to hear from you.

Look forward to seeing you again.

Hope to hear from you soon.

See you soon.

І на закінчення не забуваємо про традиційні побажання з нового рядка.

Love, / Lots of love,

All the best,

Take care,

Best wishes,

Dear John,

Sorry, I've taken so long to put pen to paper, but I was very busy with my exams. How are you? I like your choice to become an actor. And I know that you are very talented and creative and you'll do your best to become famous one day.

As for me I am going to be a doctor and I want to enter the medical college. I know that this job is quite difficult and I must know a lot of things. But I am not afraid of any difficulties.

To be ready for my future profession I read and learn a lot about human body, different diseases and their treatments. Also I attend extra classes of biology and chemistry. But the most important thing is medical practice. That's why I attend preliminary courses at town's medical college.

To my mind, a good doctor should be not only well-educated. He must be careful, polite and attentive. He can't make a mistake. A good doctor must be very heedful and openhearted. He should take care of his patients and try always to help them.

So far I have not decided what kind of a doctor I want to be. Whether I once become a surgeon, pediatrician, or physician, all I know now is that I certainly want to become one of those people who are exalted by people for the job that they do.

I would be glad to hear from you soon. Give my best regards to your parents.

Yours,

James

PROPOSAL LETTER

Лист-пропозиція (Proposal letter) — найпоширеніший вид ділового листування. Лист адресується потенційному партнеру чи замовнику у вигляді викладених умов або пропозицій щодо співпраці.

Мета листа-пропозиції — стимулювати адресата до ділової співпраці, залучити надійного партнера для подальшого розширення своєї сфери діяльності на взаємовигідних умовах. Від того, наскільки аргументовано, грамотно і чітко буде складено лист, залежать подальші перспективи співпраці. [20]

Структура листа-пропозиції

Зміст листа-пропозиції залежить від ідеї, продукту або проекту, що Ви пропонуєте. Пропонуємо декілька загальних деталей, які слід враховувати при складанні листа-пропозиції:

1. Вкажіть хто Ви та надайте супровідну інформацію щодо своєї діяльності.

Let me introduce…

Our team at XYZ Inc. works on…

2. Ознайомте з головною метою Вашої пропозиції.

The purpose of this proposal is to examine / evaluate / explain / describe / analyse / present…

This proposal aims to…

3. Визначте свої цілі та завдання.

At the present moment,…

The following areas for improvement can be highlighted…

4. Коротко вкажіть можливі результати співпраці.

Implementation of the above ideas would result in…

A working group should be set up by…

The following actions ought to be performed with a view to …

5. Закінчіть лист, висловивши свої сподівання на подальшу співпрацю та зазначте свої контактні дані.

We look forward to a successful working relationship in the future.

We would be (very) pleased to do business with your company.

I would be happy to have an opportunity to work with your firm.

Dear sir or Madam,

My name is Jeff Black and I am a CEO of Land Survey Inc. Our team enjoys discussing the opportunity to work with you on developing a new online map for your district.

The difficult navigation and absence of new roads and locations were slowly affecting tourist acquisition. The objective of this proposal is to make the up-to-date map in order to increase the amount of time potential tourist spend on your online map, resulting in a greater number of leads and clientele.

Our company successfully completed a similar project in Atlanta 2 months ago. Our design kept users on their website 150% longer and resulted in a 40% increase in tourism over the course of six months.

If you would like to move forward with our proposal, please send me an email so we can begin discussing and planning next steps right away.

We look forward to a successful working relationship in the future.

Thank you kindly for reviewing our proposal. If you have additional questions, I am available by email at sjohnson@gmail.com or by phone at 919-222-3333.

Sincerely yours,

Jeff Black

IRREGULAR VERBS

Infinitive	Past Simple	Past Participle	Переклад
be	was / were	been	бути
beat	beat	beaten	бити
become	became	become	ставати
begin	began	begun	починати
bite	bit	bitten	вкусити
blow	blew	blown	дути
break	broke	broken	ламати
bring	brought	brought	приносити
build	built	built	будувати
burn	burnt / burned	burnt / burned	горіти
buy	bought	bought	купляти
catch	caught	caught	хапати
choose	chose	chosen	вибирати
come	came	come	приходити
cost	cost	cost	коштувати
cut	cut	cut	різати
deal	dealt	dealt	вирішувати
dig	dug	dug	копати
dive	dove / dived	dived	ниряти
do	did	done	робити
draw	drew	drawn	малювати
dream	dreamed / dreamt	dreamed / dreamt	мріяти
drink	drank	drunk	пити
drive	drove	driven	керувати
eat	ate	eaten	їсти
fall	fell	fallen	падати
feed	fed	fed	годувати
feel	felt	felt	відчувати
fight	fought	fought	боротися
find	found	found	знаходити
fit	fit / fitted	fit / fitted	підходити
fly	flew	flown	літати
forbid	forbade	forbidden	забороняти
forecast	forecast	forecast	передбачати
forget	forgot	forgotten	забувати
forgive	forgave	forgiven	пробачати

freeze	froze	frozen	заморожувати
get	got	got / gotten	отримувати
give	gave	given	давати
go	went	gone	йти
grow	grew	grown	рости
hang	hung	hung	висіти
have	had	had	мати (щось)
hear	heard	heard	чути
hide	hid	hidden	ховатися
hit	hit	hit	вдаряти
hold	held	held	тримати
hurt	hurt	hurt	завдавати болю
keep	kept	kept	тримати
know	knew	known	знати
lay	laid	laid	класти (щось)
learn	learned / learnt	learned / learnt	вчити
leave	left	left	полишати
lend	lent	lent	давати у борг
let	let	let	дозволяти
lie	lay	lain	лежати
light	lit / lighted	lit / lighted	освічувати
lose	lost	lost	втрачати
make	made	made	робити
mean	meant	meant	означати
meet	met	met	зустрічати
pay	paid	paid	платити
prove	proved	proven / proved	доводити
put	put	put	класти
read	read	read	читати
rid	rid	rid	позбавлятися
ride	rode	ridden	їхати
ring	rang	rung	дзвонити
rise	rose	risen	підніматись
run	ran	run	бігти
say	said	said	казати
see	saw	seen	бачити
seek	sought	sought	шукати
sell	sold	sold	продавати
send	sent	sent	надсилати
set	set	set	встановлювати

sew	sewed	sewn / sewed	шити
shake	shook	shaken	трясти
shine	shined / shone	shined / shone	світитися
shoot	shot	shot	стріляти
show	showed	shown / showed	показувати
shrink	shrank	shrunk	стискати
shut	shut	shut	закривати
sing	sang	sung	співати
sink	sank	sunk	опускатися
sit	sat	sat	сидіти
sleep	slept	slept	спати
slide	slid	slid	ковзати
smell	smelt	smelt	пахнути
speak	spoke	spoken	розмовляти
spell	spelt	spelt	зачаровувати
spend	spent	spent	витрачати
spoil	spoilt/spoiled	spoilt/spoiled	псувати
spread	spread	spread	поширюватися
stand	stood	stood	стояти
steal	stole	stole	красти
stick	stuck	stuck	прикріплювати
sting	stung	stung	жалити
strike	struck	stricken	вдаряти
swear	swore	sworn	клястися
sweep	swept	swept	підмітати
swim	swam	swum	плисти
swing	swung	swung	гойдати
take	took	taken	брати
teach	taught	taught	вчити
tear	tore	torn	рвати
tell	told	told	розповідати
think	thought	thought	думати
throw	threw	thrown	кидати
wake	woke	woken	прокидатися
wear	wore	worn	одягати
win	won	won	вигравати
write	wrote	written	писати

VIDEOSCRIPTS

The Earth and its layers

The earth and its layers. Observe these images. The earth, our planet, is blue when looking at it from space because it's mostly made up of water. But we can also identify brown and green patches of land as well as white clouds floating in the sky. This is because of the materials which make up the earth. It is distributed in layers. The lightest layer, such as gases occupy the exterior layer, and the heavier ones, like rocks are in the interior. Our earth is divided into three different spheres: the geosphere, the hydrosphere and the atmosphere.

The geosphere is the most solid part of the earth and is divided into three separate layers: the core, the mantle and the crust. The core is the Earth's center. It is made up of metals and its temperatures are extremely high. The mantle is the geosphere thickest layer. The temperature in the mantle is also very high, so high that some rocks, found there, even melts. The crust is the external layer. It is composed of rocks and it is where the continents are formed as well as Islands and also the seabed. So in a sense we can say it's the ground we walk on.

The hydrosphere is the combination of all the waters that exist on earth and it makes up of three-quarters of the ground surface. Hydro means water but water as we all know can be either as a quit solid or gas, meaning it is distributed in various different ways throughout our planet. The liquid form of water is found in rivers, lakes, oceans and seas as well as in minuscule drops which make up the clouds. We see water in a solid form in ice and snow and in gas we find it in the atmosphere where the sun's heat evaporates the water from the Earth's surface.

The most external part of our planet is the atmosphere which is a layer of air which covers the earth. It is made up of gas and water vapor. The atmosphere is divided into two layers: the troposphere, which is the closest layer to the earth, and the stratosphere, which is where the ozone is located and is the most distant layer from our planet. The atmosphere is really important as it plays fundamental functions. For example, it supplies the oxygen so that the animals can live it, holds heat and it filters the sun's rays which are very harmful for living things.

Therefore, in happy learning as always, we'd like you to take care and respect nature. Don't throw rubbish on the ground, in other words on the geosphere. Do not pollute the seas and rivers with plastic cans and bottles because, as you know, the water, the hydrosphere, is absolutely fundamental for life. And, of course, try to contaminate the air as little as possible. If we are able to maintain our planet clean and healthy, all living creatures will be happier.

Landforms of the Earth

Everything you can see, oceans and land, sits on Earth's crust. The crust is not smooth and flat. If you travel across Earth's surface you might climb over rolling hills or tall mountains. Each of these is a different landform.

A landform is a part of Earth's surface that has a certain shape and is formed naturally. When you hike down between hills or mountains, you may end up in a valley. If you look up and see high cliffs, you may have actually walked down into a canyon!

A valley is the low land between mountains or hills. The sides of valleys are not usually steep. Most valleys are formed by rivers. Some valleys are formed by moving ice.

A canyon is a valley with steep sides. Some rivers make canyons as they flow. Over time, soil and loose rock are carried away by the moving water. What is left are tall cliffs that form canyon walls on both sides of the river. The walls of some canyons are very high. The Grand Canyon is about 1,524 meters (5,000 feet) from top to bottom.

Most hills are easy to climb if they are not too high or steep. The mountains are another story! The high peaks and jagged edges make a mountain hard to climb. Mountains are landforms that are much higher than the surrounding land. When two or more pieces of Earth's crust push together, a mountain or mountain range forms. Mountains can also be formed by volcanoes. Some new mountains are still growing. They are rough and jagged. Older mountains become smaller as they are worn down by the wind, water, or ice. They become rounded and not as big. When this happens, the landforms are called hills.

Travelling across plains is much easier because the land is flat. Plateaus are flat, too – but you'll have to climb up to get to them!

A plain is flat land that spreads over a long distance. Plains are wide open spaces and may form where there used to be seas.

A plateau is flat, but unlike a plain, it is higher than the land around it. A plateau is typically formed when flat land is pushed high up by movements of Earth's crust.

Duties of a Surveyor in Civil Engineering Projects

Hey guys! Welcome to civil mentor! The surveyor is the person who is supposed to make precise measurements that will identify the boundary. Surveyors help in providing unique contours on the surface of the earth which will let the engineers to make maps and construction projects. In today's video I am going to discuss about the duties of a surveyor.

Before moving on I would like you to subscribe us and press the bell icon so that you never miss an update. The following are the duties of a surveyor:

Number 1. The surveyors have to measure the distance and the angles between specific points on the Earth's surface.

Number 2. Based on reference points certain important features points are located by leveling.

Number 3. Detailed research is carried out on the records related to the land survey and the titles of the land.

Number 4. The boundary lines are to be located by searching for the passed boundary present in the site.

Number 5. The surveying is conducted and the obtained results are recorded later. They are verified for accuracy and corrections.

Number 6. Based on the surveyed records, plots, maps, the respective reports of the surveyed site is prepared.

Number 7. The findings obtained from this surveying is presented to the clients and to the respective government agencies.

Number 8. The official land needs and water boundaries are also established. These are established either for lease or deeds.

That's all for today, see you in the next video! Thanks for watching this video.

Surveying 1 - Introduction to leveling

Hi, I'm Jason from OTEN, Western Sydney Institute, the largest provider of online and distance education and training for TAFE New South Wales.

OTEN has created a series of 'How To' videos on site surveying, using a level.

Today we're at the [Narimba Campus], demonstrating the use of a level with headteacher David.

- How are you, Dave?

- Hi, Jason.

- So, what are we going to be going through today?

- Jason, today I'm going to demonstrate the setup and use of the automatic level, commonly used on building sites.

- Great, well I'll leave you to it then!

- Thank you.

Ok, the automatic level is one levelling instrument used on a building site. And there's basically three components in its use. There's the automatic level itself, the tripod on which it sits, and when we take a reading, that's to the staff.

I'm now going to demonstrate the setup of the level and first we're going to place the tripod.

Tripods come in two types. Firstly, there's this one, the dome top. And there's also a flat top. With the automatic level, we generally use a dome top tripod.

The tripod legs have to be placed firmly in the ground and we try and keep the top of the tripod level. The instrument's then removed from its case, and placed on top of the tripod. And it's fixed by a screw from underneath.

So, we can level the instrument using the dome top by loosening the screw and moving it over the dome top, until the bubble is in the middle of the circle.

In the event we can't level it on the dome top, then we have to use the levelling screws. To do that, we need to place the axis of the telescope parallel to the line between two levelling screws. Then by turning the levelling screws both in, or both out, never in the same direction, we bring the bubble adjacent to the centre of the circle. We then rotate the instrument 90 degrees, and use the third levelling screw to bring the bubble into the middle of the circle.

We can then check just by rotating the instrument around through a few locations, to check that the bubble remains in the circle.

These are the features of the automatic level. First we have the telescope, which contain the optics for the level. The eyepiece, which we view through, and within those, we have some crosshairs. This is the focus screw, to bring our target into focus. And here we have a fine adjustment or fine tangent screw, to make very small adjustments to the direction of the level. Sitting on here we have the bullseye level which we level the instrument to. And here we have a prism, which allows us to view that bullseye target from the horizontal direction.

The automatic level is a sensitive piece of equipment which must be cared for. The instrument can't be dropped, and must be transported in its case, well secured.

When setting up the level, ideally you will set it up at eye-height, not as I'm demonstrating now where I have to stoop down to read through the level.

When moving around the instrument, be careful not to place any pressure or put your weight on the tripod legs. This will push the level out of adjustment. And when moving around the tripod, make sure we don't trip over the legs.

And even placing pressure on soft ground adjacent to one of the legs may cause the instrument to go out of level.

- Thanks, Dave.

- So, what we've just seen is setting up the tripod, placing the instrument, and then leveling the instrument.

- So, what are we going to see next, Dave?

- Jason, now I need to show you how to take a reading through the instrument.

NGA Explains: What is Cartography?

Cartography is the study and practice of making maps. A map can show you how to navigate around the entire world, or just how to find the right store in a shopping mall. But because a map is a visual representation of a place, a cartographer needs to be part scientist and part artist to communicate that information in the best way possible.

There are different types of maps for different purposes. General Purpose maps, like roadmaps call out important natural and man-made features.

Thematic Maps focus on a particular topic or theme, like weather or statistics.

Topographical Maps are similar to general purpose maps, but include elevation details with contour lines.

Marine Navigation Charts are maps for the water, and Cadastral Maps show land surveys.

This cadastral plan was drawn by President George Washington. As a young man George Washington worked as a surveyor in Virginia and created hundreds of maps through his life. So as a military commander he understood the value of cartography and created the office of Cartographer to the Continental Army to aid in the fight for independence.

The work of mapmaking to support the military is now carried on by the National Geospatial-Intelligence Agency.

In addition, NGA creates aeronautical charts, maritime publications, and many other products for government and commercial use. This means you can use an NGA map whether you're travelling by plane, train, boat, or even sled dog. You see, NGA recently finished a multi-agency and academic partner project to create high quality maps of arctic topography.

The remote location and inhospitable environment make it a challenge to create maps of the arctic. But by collecting thousands of

satellite images and aerial videos, the team generated 3D digital elevation models of arctic land mass at a resolution much more accurate than anything that previously existed.

The ArcticDEM project is a way NGA is pushing the boundaries of cartography to better understand our world. As we keep collecting more information about the Earth, a cartographer's work is never done.

But whether you need to go across town or to the North Pole, an NGA map can get you there.

History Moments: Surveying

Surveyors measure the boundaries of a piece of land, and then calculate the area within the boundaries using geometry.

If I wanted to own land in the 1700s, I would buy the right to a certain number of acres, say 100. I'd contact the county surveyor, and he would look in his book and show me areas of the county where there was unclaimed land available.

Then we would go out and look at the possibilities. From the unclaimed land, I can choose the land I want and its exact boundaries. It's up to the surveyor to calculate the area while he's surveying, to make sure I don't go over 100 acres.

The surveyor starts at a landmark, like this lovely tree. Then he measures a straight line to the next landmark.

"I'd like that stream over there." He uses a compass to measure the direction, and chains to measure the distance. When he gets to that landmark, he finds the next landmark.

"I'd like that big pine tree," and so forth. He writes down the direction, distance, and landmarks so he can make a map when he's done.

Ooh, my map looks a little funny.

Hmm.

Well, fast forward to the 1800s. The United States was getting bigger, and the government wanted to sell land. So, they sent surveyors out first.

Look what they did!

Looks like the surveyors decided to keep it simple.

How Satellites Track Your Exact Location

GPS satellites are constantly bathing the world in their electromagnetic signally glow, but how EXACTLY do these satellites find you?

Saying a satellite finds YOU is very Enemy of the State, very NBC TV government drama; but GPS satellites don't actually track you, they're simply broadcasting a signal that you pick up. What would be a more accurate way to look at it is, GPS doesn't find you, but you find it.

The Global Positioning System is network of around 30 satellites, a receiver, and a SUPER accurate clock; all pulled together with math. The system was created in the 1980s for the military, but they opened it up for civilian use, and it has since changed how we find directions, look for pizza, and connect with each other. But how it works, requires a TON of incredible science.

Firstly, we have to know what time it is. I know that seems strange, but if you don't have a SUPER ACCURATE measure of time, you can't do GPS! The most accurate measure of time humans have, is the constant, predictable vibration of an atom. The U.S. Naval Observatory in Washington, D.C., is the official United States time.

They mark time, by measuring billionths of a second using 9,192,631,770 electron vibrations of a Cesium-133 atom. This atomic clock is accurate to nanoseconds… which is super important.

Secondly we have to have a satellite network which ALSO know the time. As of October 19, 2015, there were GPS 31 satellites with three atomic clocks on board, as well as transmitters to send microwave signals out at the planet below. The system is flying at 11,000 kilometers per hour, about 20000 kilometers above our heads (7000mph/12500mi) and is maintained by the U.S. Air Force. Those signals? Those are what are telling you where you are on the planet!

Okay, so. GPS signals are sent at exact intervals. Say… every few seconds. Embedded in microwave signal is the ID of the satellite, the

health of the satellite, the location of all the satellites in the system, and the precise date and time. VERY precise. Because Tens of thousands of kilometers away on the ground, the signals will be picked up by your smartphone once you click, let the pizza app know your location.

Smartphones and GPS units have to have very precise time, because microwave signals travel at the speed of light, roughly 300,000 kilometers per second, so in a fraction of a second, the signal travels from each satellite to you! This is why we need atomic clocks, because 20-30 nanoseconds matter!

But we'll come back to this in a sec. The receiver can tell where each satellite is, by the difference in time lag. Using a mathematical process called trilateration the GPS unit can determine your exact location. Basically, a sphere is drawn indicating the time lag from each satellite and the overlapping point is your current location! After ALL THAT, the pizza app knows exactly where you are.

Before you get confused, there's NOT an atomic clock in your smartphone, but as long as the smartphone clock is pretty good, it can will regular updates from the Observatory clock and stay on track!

The more satellites it can "see" the more accurate the location. If you pick up three satellites, your GPS can determine your 2D location (latitude and longitude), but with four it can tell your altitude too!

As you move, the time lag from the satellite to the antenna of each signal will change, and by constantly updating the trilateration math, the location dot on your map moves. Even after all this work just to get a pizza delivered, there's a ton more complications.

Satellites need replacement, and only have an operational life of 7-15 years. So they have to keep launching new ones. We're on our fifth generation now, and they're getting a lot better, but they're not perfect. The satellite signals can bounce off an ionized layer of the atmosphere called ionosphere -- AM radio bounces off it from the ground too. It's not friendly to signals going through it. But on top of THAT GPS satellites are traveling FAST and far away, meaning Einstein's General & Special Relativity comes into play.

Even if the atomic clocks are super accurate, the ones on the satellites are ticking faster than the Naval Observatory clock, because gravity is stronger on Earth and they're moving so fast!

SO!

The GPS has to mathematically calculate and adjust for the roughly 45,000 nanoseconds per day of difference in time; since being off by 20-30 nanoseconds can make the system pretty much worthless. This a big deal. It's frickin' crazy.

Thanks to the space program, Einstein's relativistic physics, atomic clocks, and smart phones, you my friend, can get a pizza delivered to your exact location -- give or take a few feet.

What do you want? We're not perfect. Yet.

The next generation should get us within inches.

And thank you also to the US Air Force for sponsoring this message, and making sure the pizza guy knows where to come. Every day American Airmen go above and beyond to break barriers both professionally and personally. The United States Air Force is powered by Airmen, fueled by innovation. Crazily enough, your BRAIN has GPS too, after a fashion. A set of cells creates a map of the stuff around you…

No, no, I'll let this super handsome guy with a great t-shirt collection explain it.

Zoning Matters: How Land-Use Policies Shape Our Lives

Zoning is a way for communities to separate land by use or form. For example, an area could be dedicated to commercial or industrial use, or there could be a restriction on how many housing units can be built.

Zoning shapes the places where we live, but it also shapes our lives.

Local zoning regulations determine where we can find housing, schools, and parks, and who gets to use them. Policymakers initially created zoning codes to protect public health - for example, to stop residents from getting sick from living too close to factories.

But from the start, zoning has separated more than just land uses. It has also separated people.

In the early 20th Century, many communities explicitly used zoning ordinances to racially segregate neighborhoods — effectively declaring that different skin colors were as incompatible as a family's home and a smokestack.

By the late 20th century, civil rights legislation outlawed overt housing discrimination. But those explicit racial barriers were quickly replaced by subtler methods.

Even today, exclusionary zoning policies that restrict lower-cost or higher-density housing limit racial and economic diversity and raise housing costs. By driving up housing costs, restrictive zoning can exclude people from equal access to public resources, like schools and parks, and leave lower-income workers unable to afford housing close to available jobs.

When regions are more economically and racially segregated, everyone loses. Local economies see slower growth and residents of all races are less upwardly mobile.

And finally, despite being created to protect public health, zoning often pushes multifamily buildings closer to highways and areas with higher concentrations of air pollutants.

As a result, low-income people and people of color are more likely to live in places that could make them sick.

It doesn't have to be this way. When done thoughtfully, zoning can connect people and places, not divide us.

Communities across the US are beginning to reexamine the role of zoning and change their restrictive zoning rules — opening neighborhoods to multifamily housing, walkable densities, and more.

For more information and resources, and to find out what other communities are doing to improve their zoning policies, go to urban.org/zoning.

visualization	візуалізація

W

warp	згинати, тягнути
warranty	порука, запорука, гарантія
watershed	вододіл
workplace	робоче місце
work out	обчислити

GEODETIC ABBREVIATIONS

2D – Two Dimensional

3D - Three Dimensional

A

AAA – analytical and advisory activity

AASTR – Advanced Along Track Scanning Thermal Radiometer

ABGPS – Airborne GPS

A/C – Aircraft

ACE – Advanced Cartographic Environment

ACS – Active Control System

ADP – Advanced digital processing

ADP – Automated data processing

AGRG – Applied Geomatics Research Group

Alt. – Altitude

ALTM – Airborne Laser Terrain Mapper

ALTMS – Airborne Laser Topographic Mapping System

AM – Automated Mapping

ANSI - *American national standards institute*

AOI – Area of Interest

ARC/INFO – is a full-featured geographic information system produced by Esri, and is the highest level of licensing (and therefore functionality) in the ArcGIS Desktop product line. The name refers to its architecture as a geographic information system composed of:

1. geographic input, processing, and output tools ("ARC") with
2. a complementary, but separate database ("INFO")

ASAR – Advanced Synthetic Aperture Radar

ASTER – Advanced Spaceborne Thermal Emission and Reflection Radiometer

AT – Area Triangulation

ATR – Automatic Target Recognition

AVHRR – Advanced Very High Resolution Radiometer

AM/FM – Automated Mapping/Facilities Management

B

BLDG – Building

BM – Bench mark

C

CAD – Computer Assisted Design

CADMAP – Computer-aided drafting, mapping, and photogrammetry

CAS – Centre of Administrative Services

CAT – Computed Axial tomography

CGS – Certified Geomatics Specialist (CIG Certification Program)

CIR – Color infrared

CLIP – Calling Line Identity Presentation

COGO – Coordinate Geometry

COGS – Centre of Geographic Sciences

CORS – Continuously operated reference station(s)

D

DARPA – Defense Advanced Research Projects Agency

DB – Data base

DBMS – Database management system

DCW – Digital Chart of the World

DD – Decimal degrees

DEM – Digital Elevation Model

DGPS – Differential Global Positioning System

DIPS – Digital Image Processing System

DMTI – Desktop Mapping Technologies Inc.

DN – Digital Number

DO – Digital Ortho

DOQ – Digital orthophoto quadrangle

DOQQ – Digital orthophoto quarter quadrangle

DPI – Dots per inch

DQQ – Digital quarter quadrangle

DRF – Digital Raster File

DTD – Digital Topographic Data

DTED – Digital Terrain Elevation Data

DTM – Digital Terrain Model

DVD – Digital versatile disc

DXF – Drawing Interchange File

DXF – Digital Exchange Format

E

ECRF – Earth Centered Reference Frame

EMS – electromagnetic spectrum

ENVISAT – Environmental Satellite

EO – Earth observation

EOF – End of File

EOSAT – Earth Observation Satellite

EOT – End of Text

ERDAS – Earth Resources Data Analysis System

ERS – Earth Remote Sensing Satellite

ERS – European Remote Sensing Satellite

ESA – European Space Agency

ESRI (Esri) – Environmental Systems Research Institute

ETM – Enhanced Thematic Mapper

EVI – enhanced vegetation index

F

FAC – Feature analysis code

FACC – Feature and Attribute Coding Catalog

FACS – Feature Attribute Coding Standard; Feature Attribute Coding System

FCC – False color composite

FOV – Field of view

G

GCP – Ground control point

GDP – GeoConnections Discovery Portal

GEO – Group on Earth Observations

Geol. – Geology

GEOSAT – Geodesy Satellite

GI – Geospatial information

GIS – Geographic Information System

GLONASS – Global Orbiting Navigation Satellite System (Russia)

GMT – Greenwich Mean Time

GN – Grid north

GNSS – Global Navigation Satellite System

GOES – geostationary operational environmental satellite

GPR – Ground Penetrating Radar

GPS – Global Positioning System

GRASS – Geographic Resource Analysis Support System

GRD – Ground Resolved Distance

GRIDS – Grid Referenced Information Display System

GRS 80 – Geodetic Reference System of 1980

GRS – Geodetic Reference System

GUI – Graphical User Interface

GVI – Green vegetation index

H

ha – Hectare; Hektar

HBM – Hydrologic bench mark

HC – Hard copy

HDOP – Horizontal Dilution of Precision

HF – High frequency

HP – Hewlett Packard

HPN – High Precision Network

HSV – Hue Saturation Value

HTML – Hyper Text Markup Language

I

IBC – International Boundary Commission

ICA – International Cartographic Association

IGS – International GNSS Service

ILM – Integrated Land Management

ILMF – International LiDAR Mapping Forum

ILRIS – Intelligent Laser Range Imaging Scanner (Optech)

IM/IT – Information Management/Information Technology

IMAGE – Integrated Mapping and Geographic Encoding System

INS – Inertial Navigation System

InSAR – Interferometric Synthetic Aperture Radar

I/O – Input/output

ISO – International Organization for Standardization

ITRF – International Terrestrial Reference Frame

K

KBPS – Kilobytes per second

KGPS – Kinematic GPS

kHz – Kilohertz

km – Kilometer

L

LANDSAT – Land Satellite

L/C – Land cover

LBS – Location-Based Services

LCA – Land cover analysis

LCD - liquid crystal display

LIDAR (LiDAR) – Light Detection And Ranging

LMS – Large-scale mapping system

LMS – Lidar Mapping Suite

LOS – Line-of-sight

LRS – Linear Referencing System

LSI LiDAR – Services International

M

MB – Megabyte

MCE – Mapping and Charting Establishment

MLW – Mean low water

MRSID – multi resolution seamless image database

MSL – Mean sea level

MSDI – Marine Spatial Data Infrastructure

MTM – Maritime Transverse Mercator

N

NACCSM – National Advisory Committee on Control Surveys and Mapping

NAD – North American Datum

NAD27 – North American Datum of 1927

NAD83 – North American Datum of 1983

NAD83 (CSRS) – North American of Datum 1983 (Canadian Spatial Reference System) an adopted modern datum used in Canada

NAPL – National Air Photo Library

NASA – National Aeronautics and Space Administration

NATO – North Atlantic Treaty Organization

NAVD – North American Vertical Datum

NAVD 88 – North American Vertical Datum 1988

NDVI – normalized difference vegetation index

NIF – National Information Framework

NIR – near infrared

NMAS – National Map Accuracy Standards

NTS – National Topographic System

O

ODC – Open Data Consortium

OGC – Open GIS Consortium
OQ – Orthophoto quadrangle

P
PCA – Principal components analysis
PE&RS – Photogrammetric Engineering & Remote Sensing
PID – Polygon identification number
PID – Property identification number
PIN – Parcel identification number
PK – Peak
PLN – Plan
PLS – Provincial Land Surveyor
PLS – Public Land Survey
PNG – Portable Network Graphic
POES – polar-orbiting operational environmental satellite
POS – Position and Orientation System
PPP – Precise Point Positioning
PSI – Public sector information

Q
QA – Quality assurance
QA/QC – Quality assurance/quality control
QC – Quality control
QGIS – Quantum GIS
QS – Quadratic splines

R
RA – Rural area
RADAR – Radio Detecting and Ranging
RADARSAT – RADAR Satellite
RAM – Random access memory
R&D – Research and development
RDI – Resource Data International Inc.

RGB – Red-green-blue

RIP – Raster Image Processing

RMS – Root mean square

RMSE – Root mean squared error

RS – remote sensing

RTK – Real Time Kinematic

S

SAR – Synthetic aperture radar

SDB – Spatial data base

SDE – Spatial Database Engine

SDI – Spatial Data Infrastructure

SDSS – Spatial decision support systems

SGB – Surveyor General Branch

SLAR – Side Looking Airborne Radar

SLP – Slope

SMB – Surveys and Mapping Branch

SMIRR – Shuttle Multispectral Infrared Radiometer

SPC – State Plane Coordinate

SPCS – State Plane Coordinate System(s)

SPOT – Satellite for Earth Observation

SQL – Standard Query Language

Sta – Station

S-VGA – Super Video Graphics Array

SW – surface water

SWIR – short-wave infrared

SYMAP – Synagraphic Mapping System

T

TBD – To be determined

TGO – Trimble Geomatics Office

TIFF – Tagged Image File Format

TIGER – Topologically Integrated Geographic Encoding and Referencing

TIN – Triangular Irregular Network

TIR – Thermal infrared

TIRS – Thermal Infrared Scanner

TM – Thematic Mapper (Landsat); Timber management

TOA – top of atmosphere

TPS – Thin-plate splines; Topcon Positioning Systems

TQ – Topographic quadrangle

TVC – Tagged Vector Contours

U

UAV – Unmanned Aerial Vehicle

URISA – Urban and Regional Information Systems Association

UTC – Universal Time Coordinated; Urban Traffic Control System (Siemens)

UTM – Universal Transverse Mercator

W-X

WMF – Windows Metafile Format

WWW – World Wide Web

W3C – World Wide Web Consortium

XML – eXtensible Markup Language

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