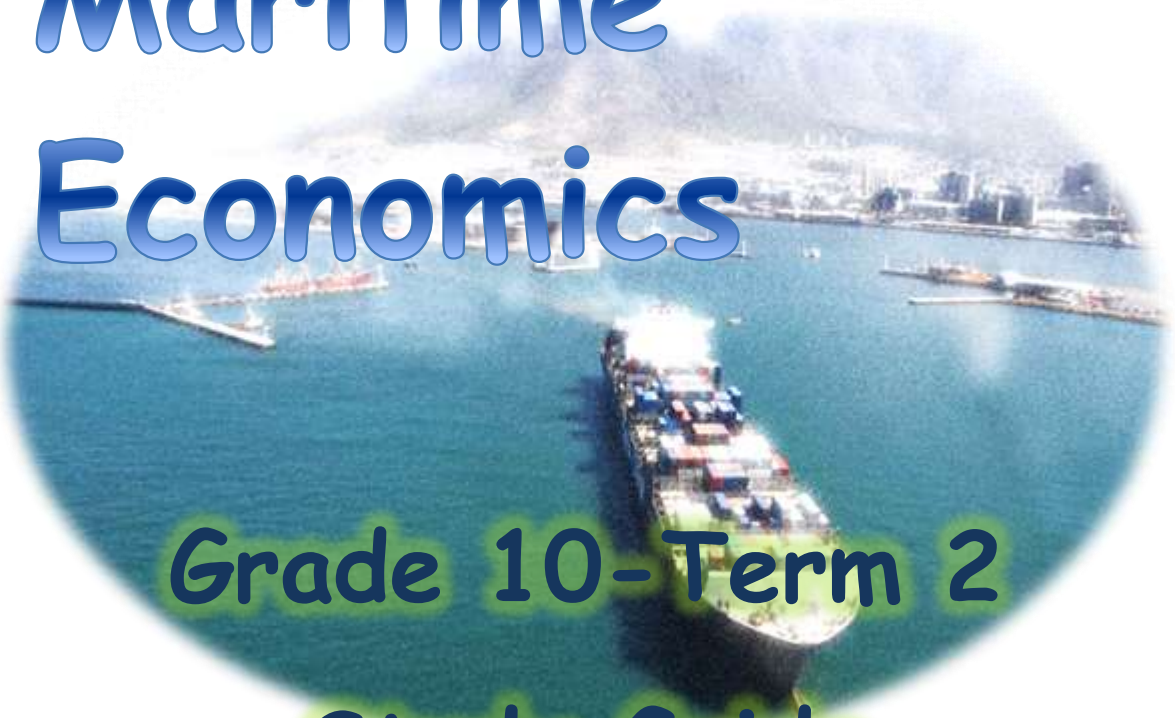
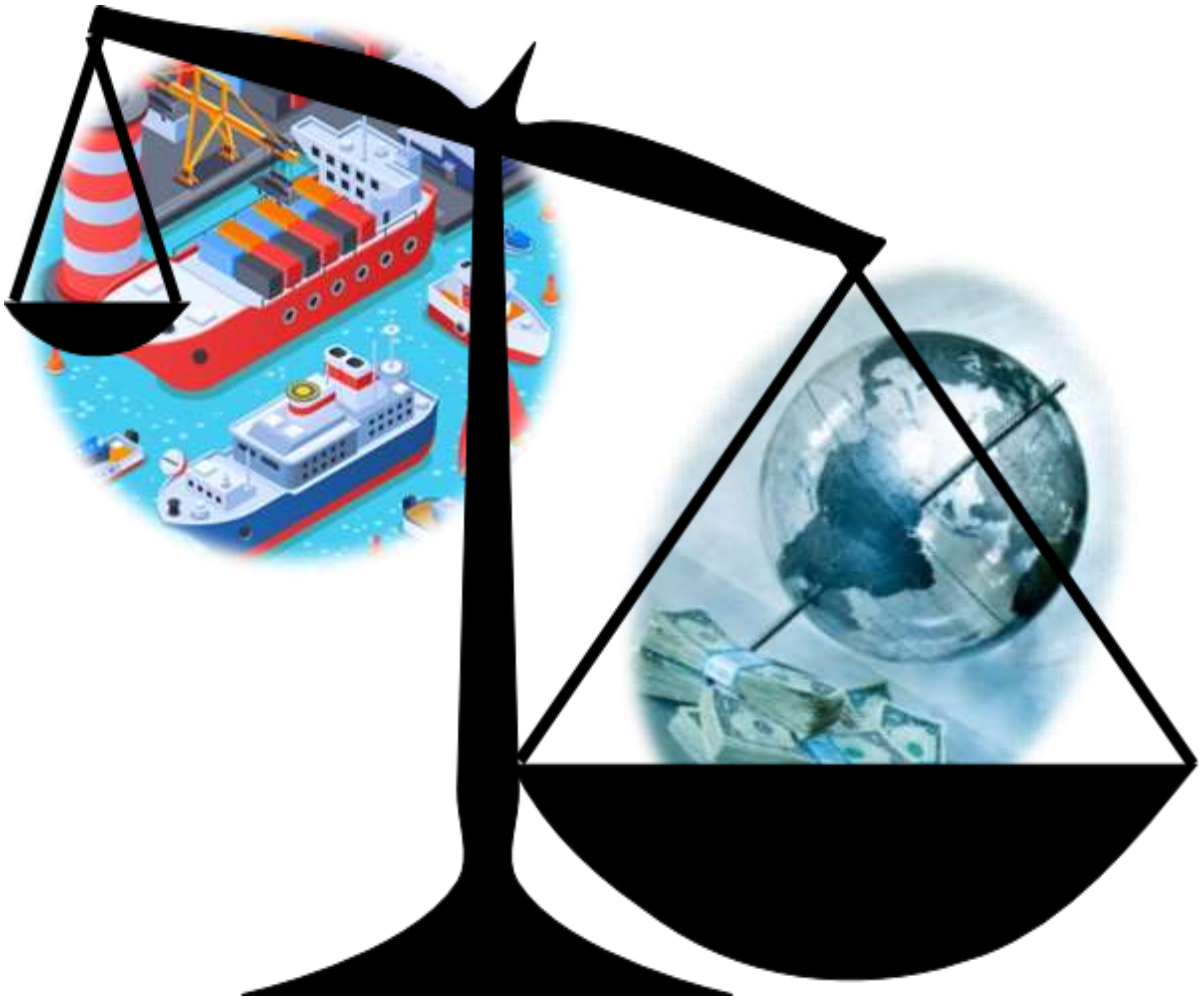
Maritime Economics



Grade 10-Term 2

Study Guide



Maritime Economics
Grade 10 – Term 2

STUDY GUIDE

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Primary resource:
Brian Ingpen, http://maritimesa.org/grade-10/, 2015

MOVE BEYOND CONSULTING

CONTENTS

PREFACE

The following icons are used in this study guide:

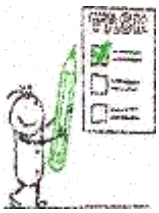
This is a note or an example.

This is a warning: It tells you about potential pitfalls and how to avoid producing errors.

This is a reference: It provides you with additional information that will help you with the subject under discussion.

This is a Question: Anything appearing in a box of this type is a question based on an application on the subject under discussion.

This is self-assessment: you are required to answer the questions found at these icons, as it will assist you in mastering the content.



This is a task: you as the learner must complete the exercises/tasks/activity/assignments that appear in the learning units.

This is a hint or a tip: It will guide you through the learning opportunity.

This is an experiment: It is an empirical procedure that may be used to test models or hypotheses.

Learning Outcome 2: Shipping Operations

1.1 What does *shipping operations* mean

- According to the Merriam-Webster dictionary ***operation*** is a countable noun and is the performance of a practical work.
- According to the Collins dictionary ***operation*** is a highly organized activity that involves many people doing different things.
- So merchant *shipping operations* would mean highly organized shipping activities to efficiently deliver goods.
- There are over 50,000 merchant ships in the world, transporting cargo.
- The use of these merchant ships and the movement of the cargo needs is a coordinated operation and generates an estimated annual income of over half a trillion US dollars in freight rates.

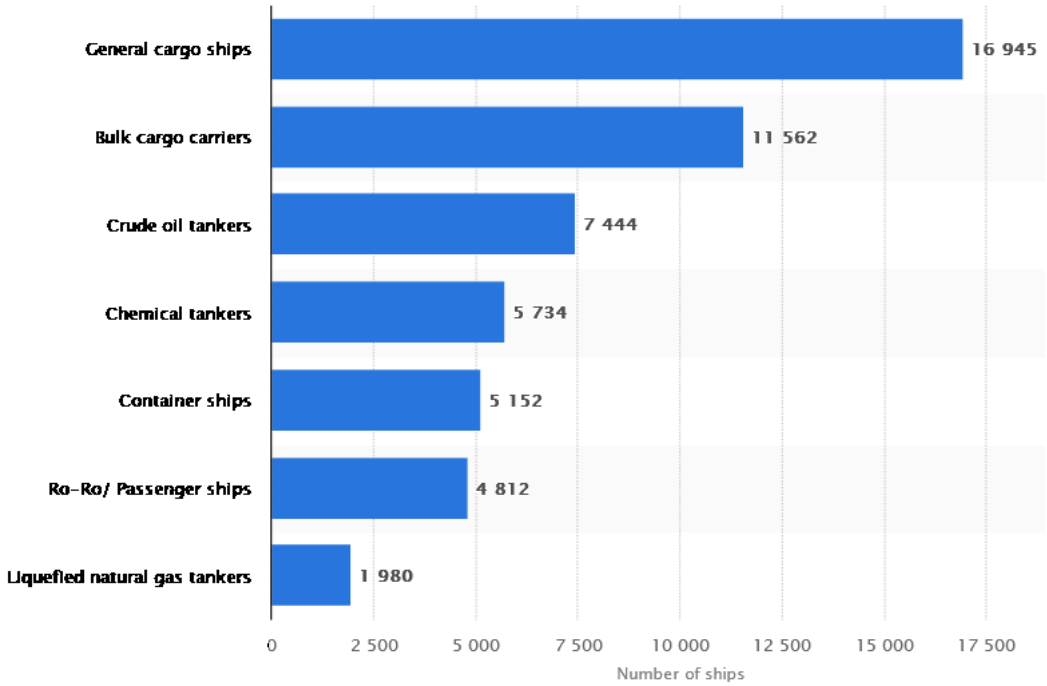
Meaning of SHIPPING OPERATIONS

Commercial shipping operations are organized shipping activities to efficiently deliver goods. Shipping operations includes ship building, ship repairs, ship management, crewing, port infrastructure, aids to navigation, cargo handling, transport corridors and services, insurance, marine safety, marine salvage and voyage planning and costs.

Figure 1: Sample of shipping operations on site at the Port of Rotterdam. Shipping operations are inland as well.

Task 1:

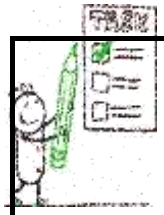
The figure alongside is a bar graph showing the number of merchant vessels in the world by 1 January 2019.



1.1. List some of the operations which you see necessary to run the world's fleet of merchant vessels.

1.2. What is the total number of ships?

1.3. What is the percentage of each ship type compared to the total number of ships? (Round your answer up and to the first decimal).



Task 1 continued…

1.4. What is the ratio of crude oil (CO) tankers compared to liquefied natural gas (LNG) tankers?

1.5. What does your answer in 1.3. imply?

1.6. Give some reasons for why there are presently more crude oil tankers in the world than liquefied natural gas tankers?

Did you know:

Shipping operations for transportation of natural gas includes:

- Chartering of an LNG carrier;
- Extraction of natural gas from well;
- Gas pipeline leading to the seaside;
- Liquefaction of the natural gas;
- Storage facilities;
- Loading of the LNG onto a carrier;
- Logistics for loaded voyage;

- Unloading of the LNG;
- Regasification of the natural gas; and
- Distribution of the natural gas.

Self Assessment 1:

What do you think is the reason for the operation of liquefying natural gas before transportation over long distances by ship?

Did you know:

- Natural gas is liquefied by lowering the temperature of the hydrocarbon to approximately -160^{o}C.
- LNG is the acronym for **l**iquefied **n**atural **g**as.

1.2 Some Terminology used in Shipping Operations

We will now look at words and terms that are common in shipping operations.

These words might appear strange at first, but remember that our mind is a sponge for new words. It will soak all the words in.

1.2.1 Some Terminology: Ports

Harbour: Vast spacing with narrow entrance where vessels can have safe ***mooring***.

Dock: An area of water that is partly enclosed, usually by concrete, where ships can work their cargo.

Terminal: An area of the harbour where specialised cargoes are handled.

Mooring: A permanent structure to which a vessel may be secured to forestall free movement of the ship on the water.

Wharf (Quay): A platform to which a ship is ***moored***.

Berth: A place in a ***harbour*** where ships can come alongside to work their cargo, and/or to refuel.

To berth: The process of a ship coming alongside a berth in a harbour.

Breakwater: A structure to prevent heavy swell from damaging a harbour.

Jetty (Pier): Structure built out into sea (or into bay/river) where vessels can ***berth***.

(see Figure 7 **to** Figure 8 **for illustrations)**

Figure 2: Example of a natural harbour - Saldanha Bay, in Western Cape, RSA

Figure 3: Proposed dock for loading and unloading of ships in Durban, RSA

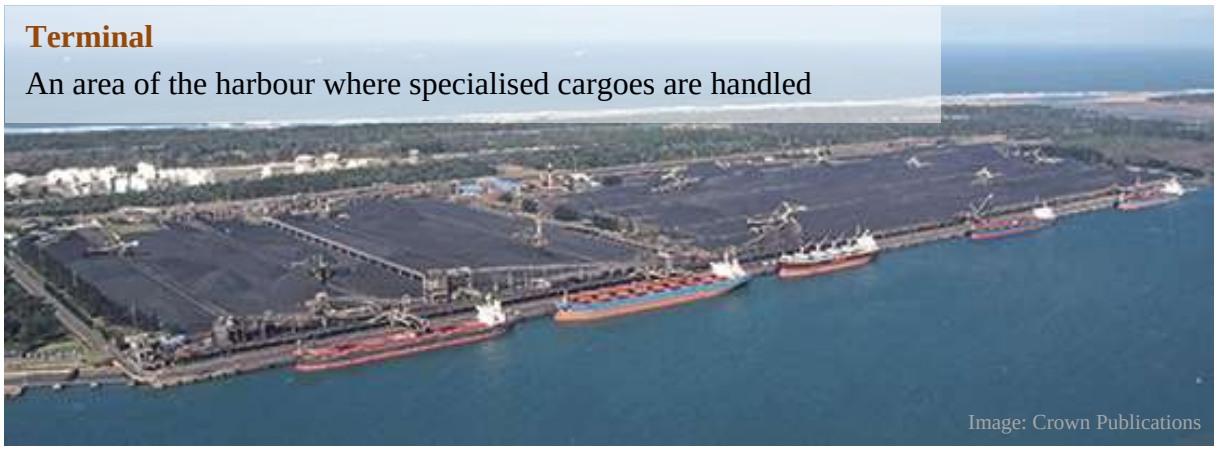


Figure 4: Coal terminal at Richards Bay, RSA

Figure 5: South Africa's S.A. Agulhas II moored at the V&A Waterfront, Cape Town

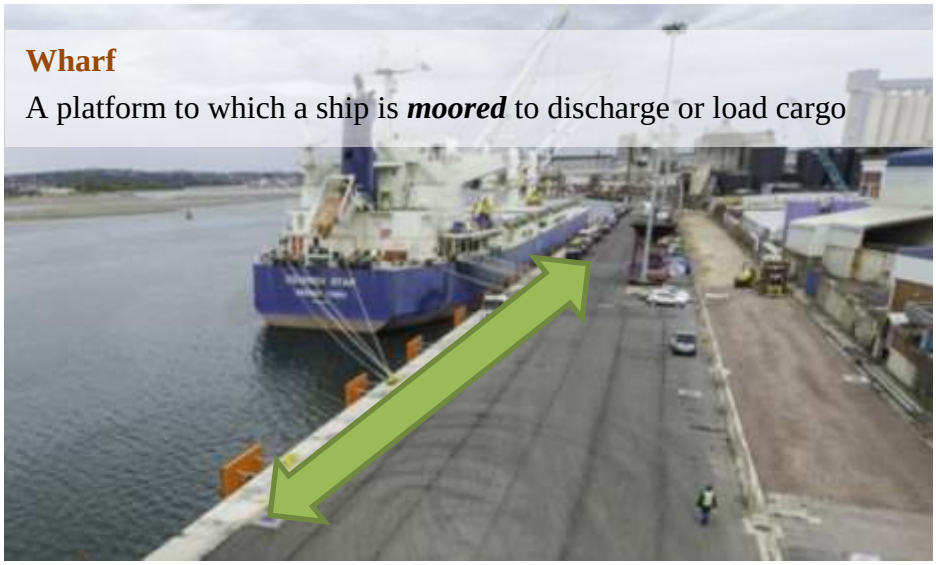


Figure 6: Maydon Wharf, Durban

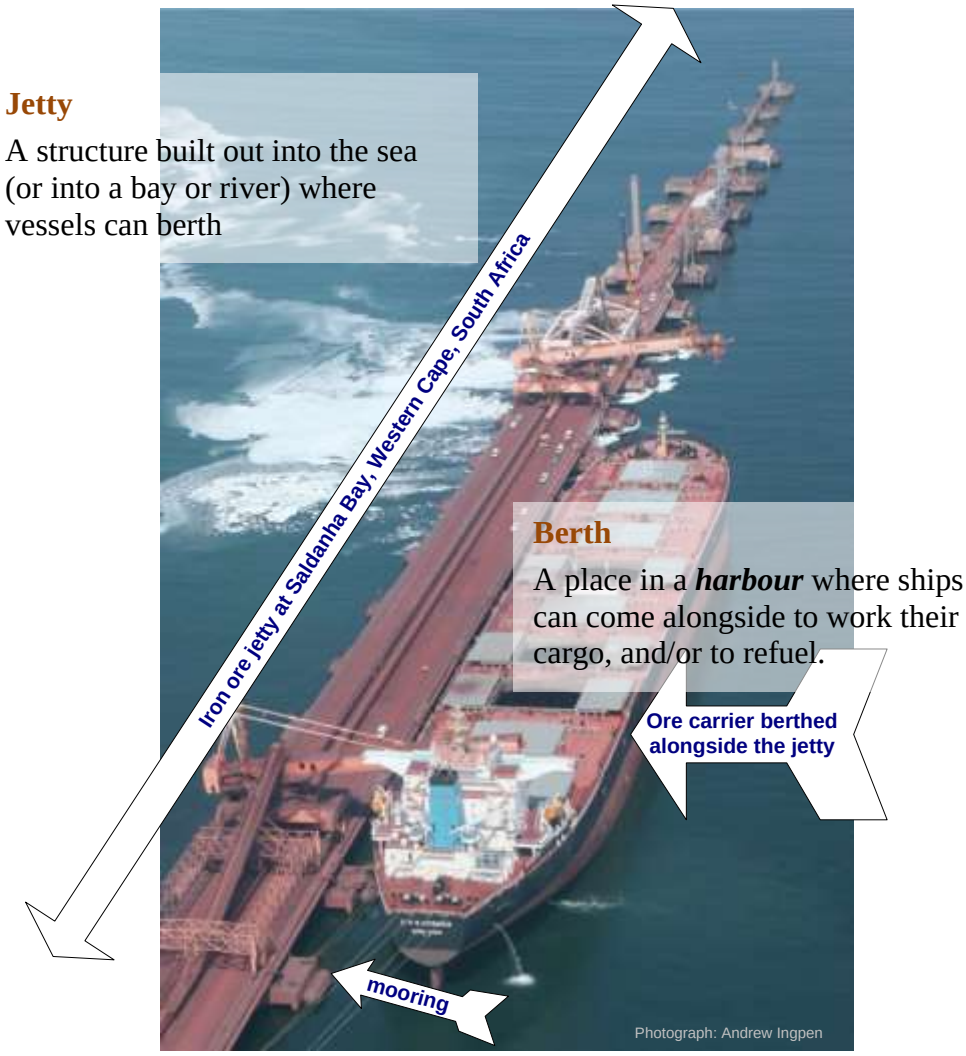
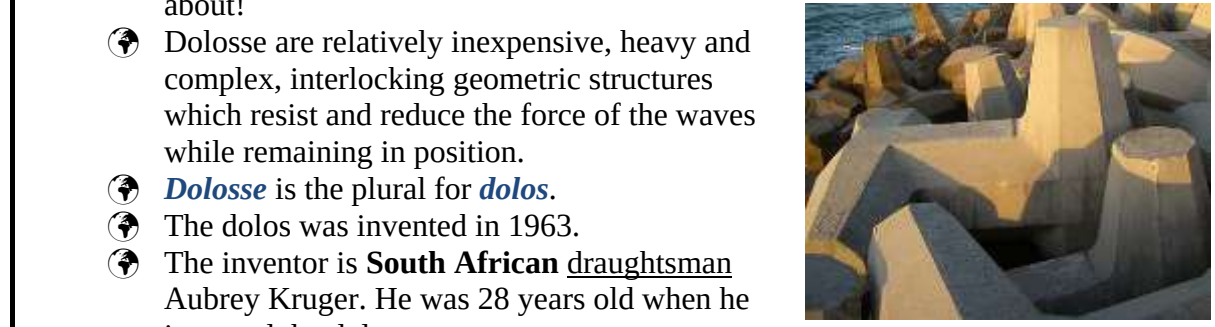


Figure 7: Jetty, berth and mooring

Figure 8: Dolosse breakwater protecting port entrance in East London.

Did you know:

- Previously large rocks and blocks of concrete were the most common means of providing ***breakwater*** protection against the notorious waves of South Africa's eastern coastline. These large blocks and rocks could be washed away or moved about!
- Dolosse are relatively inexpensive, heavy and complex, interlocking geometric structures which resist and reduce the force of the waves while remaining in position.
- ***Dolosse*** is the plural for ***dolos***.
- The dolos was invented in 1963.
- The inventor is **South African** draughtsman Aubrey Kruger. He was 28 years old when he invented the dolos.
- The dolos is a complex geometric shape.
- Aubrey Kruger's "prototype" was made with the family's broomstick! He cut out three pieces of the stick wood and nailed them together in the shape of an **H**, with one twisted leg!
- A dolos can weigh up to 80,000 kg (80 tonnes).
- Dolosse is a successful means of absorbing and controlling energy produced by pounding waves.
- Dolosse is used across the world.



The inventor's daughter said that her mother was rather angry because she had to shoo a chicken out of the kitchen with a shortened broomstick!

Did you also know:

- Hurricane Sandy inflicted USD31.4 million worth of damages to the Cleveland Harbour East Breakwater in October 2012.
- The renovation team's key element in reconstruction of breakwater is South Africa's dolosse!
- The American team describes dolosse as "ingenious geometric concrete structures".
- The renovation, with using dolosse was expected to cost USD36 million!

Self Assessment 2:

2.1. In which country is Cleveland Harbour?

2.2. Use an exchange rate of 1 USD = 6 ZAR and convert USD31.4 million to ZAR

2.3. Use an exchange rate of 1 USD = 18 ZAR and convert USD36 million to ZAR

2.4. As a buyer, which exchange rate would be better for you, 6 ZAR/USD or 18 ZAR/USD?

1.2.2 Some Terminology: Port Management

Marine Division: responsible for the safe movement and mooring of ships as well as marine services in the harbour such as vessel control, pilotage, tug services, drydocking, bunkering, harbour security, buoyage and other navigational aids.

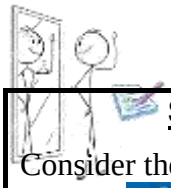
Harbour Management Division: responsible for the administration of the harbour, all the land area belonging to the harbour, harbour equipment and machinery, harbour buildings, the financial management of the harbour, and the marketing of the harbour.

Cabotage: is the transport of goods or passengers between two places in the same country.

PMAESA: is the acronym for **P**ort **M**anagement **A**ssociation of **E**astern and **S**outhern **A**frica. PMAESA is a non-profit, inter-governmental organization made up of Port Operators, Government Line Ministries, Logistics and Maritime Service Providers and other port and shipping stakeholders from the Eastern, Western and Southern African and Indian Ocean regions

Did you know:

- **Cabotage laws** apply to merchant ships in most countries that have a coastline.
- A country's cabotage laws are intended to:
  - protect the domestic shipping industry from foreign competition,
  - preserve domestically owned shipping infrastructure for national security purposes, and
  - ensure safety in congested territorial waters.
- In the United States, the Merchant Marine Act of 1920 (**Jones Act**) requires that all goods transported by water between U.S. ports be carried on U.S.-flag ships, constructed in the United States, owned by U.S. citizens, and crewed by U.S. citizens and U.S. permanent residents.



Self Assessment 3:

Consider the picture below and answer the questions

3.1. List countries from the G8 that have cabotage laws?

3.2. Does New Zealand have cabotage laws?

3.3. Does South Africa have cabotage laws?

3.4. Which country closest to, and to the east of South Africa has cabotage laws?

3.5. Name the landlocked country between Russia and China which does not have cabotage laws? In your opinion, would there be a need for this country to have maritime cabotage laws?

3.6. Locate the Democratic Republic of Congo (DRC) on the map. Notice that this central African country has no sea coast. Why would the DRC have maritime cabotage laws?

1.2.3 Some Terminology: Shipping Companies

Shipowner: A shipowner is the owner of a vessel and equips and exploits a ship for commercial gain. The shipowner may choose not to operate the ship himself/herself but to entrust the operation of the ship to a third person or company. Usually a ship is not owned by a single person, but by several persons within a shipping company.

Ship's Agent: A person or firm who transact all the ship's business in a port on behalf of shipowners or charterers.

Flags of Convenience (FOC): the registration of ships in a country that offer favourable tax structures and regulations; also the flag representing the nation under whose jurisdiction a ship is registered. Ships are always registered under the laws of one nation but are not always required to establish their home location in that country

Ship Charterer: The "charterer" is the person or the company who hires the ship.

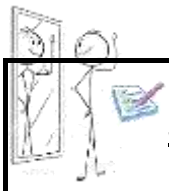
Ship Chandler: (or ship's chandler) is a **retail dealer** who specialises in supplies or equipment for ships, known as ship's stores. Supplies could include crew's food, ship's maintenance supplies, cleaning compounds, rope etc.

Clearing and Forwarding Agents: are a link between the owners of goods and owners of means of transport. They help the cargo owners in the efficient movement of goods to the buyers by completing some procedural and documentary formalities.

Shipping Line: a business that operates ships.

Did you know:

- Ship charterers are directly responsible for keeping the world's shipping fleet in business.
- Some ship charterers are also ship owners.
- Ship charterers hire ships or space on ships to move goods and even passengers
- Ship charterers either liaise with intermediaries, known as **ship brokers**, or directly with ship owners.
- Ship Charterers need to be in touch with the market to find the most suitable and cost effective transport options.



Self Assessment 4:

Why is it not usual for a single person to own a ship or a fleet of ships?

1.2.4 Some Terminology: Marine Salvage

Sea Worthiness: condition of the ship, based on the sufficiency of a vessel in terms of materials construction, equipment, crew and outfit for the trade in which it is employed. Any sort of disrepair to the vessel by which the cargo may suffer -- overloading, untrained officers, etc., may constitute a vessel to be unseaworthy.

IMO: is the acronym for **I**nternational **M**aritime **O**rganization. The IMO is a specialised agency of the United Nations and is responsible for regulating shipping. This includes **safety**, **environmental concerns**, legal matters, technical co-operation, maritime security and the efficiency of shipping.

SAMSA: is the acronym for the **S**outh **A**frican **M**aritime **S**afety **A**uthority. SAMSA is to ensure safety of life and property at sea as well as to prevent and combat pollution from ships in the marine environment. The Authority does this by administration of the Merchant Shipping Regulation.

Port State Control: is the inspection of foreign ships in national ports to verify that the condition of the ship and its equipment comply with the requirements of international regulations and that the ship is manned and operated in compliance with these rules.

Marine Salvage: is the process of recovering a ship and its cargo after a shipwreck or other maritime casualty. The salvage may encompass towing, re-floating a vessel, or effecting repairs to a ship.

Salvor: A person who salvages or assists in salvaging a ship or its cargo. A successful salvor is entitled to a reward, which is a proportion of the total value of the ship and its cargo.

Lloyd's open form: formally "Lloyd's Standard Form of Salvage Agreement", and commonly referred to as the **LOF**, is a standard form contract for a proposed marine salvage operation.

SCOPIC: a clause that may be included in LOF contracts. SCOPIC is a "safety net" to ensure a minimum payment in difficult cases to soften the demanding salvage principle of "no cure no pay".

NSRI: is the acronym for National Sea Rescue Institute. The NSRI answers distress calls from individuals and craft both at sea and on inland waters.

Did you know that SAMSA:

Carries out port state control to eliminate substandard ships from the region which pose a threat to life, property and the marine environment.

Did you know that the NSRI:

- is a volunteer run non-profit organization,
- has over 1,000 highly trained volunteers,
- operates out of 41 bases around South Africa's coast,
- has 106 rescue craft,
- has 30 rescue vehicles,
- has 16 quadbikes and 13 tractors, and
- has access to a number of helicopters.

1.2.5 Some Terminology: Cost of Voyage

Voyage Expenses: all incremental expenses including bunker fuel expenses, port fees at the loading port, cargo loading expenses, canal tolls, agency fees and commissions.

Bunker Costs: Includes bunker fuel prices and Bunker Adjustment Factor.

Bunker Adjustment Factor: is a surcharge to compensate for fluctuating fuel prices.

Port Dues: also known as ship dues or docking dues. A charge levied by the port to all ships entering the port till the time the ship leaves the port. This is usually calculated on the **gross** registered tonnage of the ship as per the tonnage certificate issued for that ship. Port dues are generally intended to cover the cost of port infrastructure such as berths, channel lighting and pilotage.

Tonnage Dues: A charge paid by the vessel operator to a port for the usage of the port. This is usually calculated on the **net** registered tonnage of the ship as per the tonnage certificate issued for that ship. This is generally charged by the port to maintain their infrastructure and entry channels and facilities used thereof like buoys and mooring.

Wharfage: (also known as cargo dues) Fee levied to exporters, importers or shipping lines for using the port facilities movement of the cargo through the port.

Canal Dues: Charged when a vessel goes through a canal.

Pilotage: A fee payable by the owner or operator of a ship for the services of a pilot. This fee is normally based on the ship's tonnage.

Towage Costs: A charge applied for the expenses of tugging a vessel to the port with a tugboat.

Demurrage: Charges that the charterer pays to the ship owner for its delayed operations of loading/unloading.

Both gross and net refer to the income of an individual or a company, but each term refers to income at a different point of accounting analysis.

- **Gross** describes the total before expenses, taxes, and deductions.
- **Net** describes the total after all expenses, taxes, and deductions have been taken into account.

Did you know:

Years back steamships used the power of steam to travel and steam was generated by feeding coal into the furnaces on board the ship. The **storage container for coal was known as a Bunker**. Since then the term **bunker became synonymous with fuel for ships**.

This is a **word puzzle**. Find all the words listed alongside.

Shipping Operations

```
                m g l f y
              y w s z n x w a
            s g k a l     m b u
          d o l o s n       v f q
        a z q f j u o         t t l
        d n y k c o d         k k c p t u y
    v o z d t q t u b r e a k w a t e r w d
    w r e r e t r a h c c s p e g a t o b a c
u i v k m z o e j f o r w a r d i n g z z p
m r k q v k d x j s h a r e h o l d i n g h
c h a n d l i n g z b f v z a g a b o v h m
o r e n w o p i h s c v f w c l e a r i n g
  k r u o b r a h f r a h w m o o r i n g
    d r f b                 p b o t
      c g                     t m
```

breakwater
cabotage
chandling
charterer
clearing
dock
dolos
forwarding
harbour
jetty
mooring
quay
shareholding
shipowner
wharf

1.3 Harbours, port location, construction and operations

Recall that a harbour is a vast spacing with a narrow entrance where vessels can have safe mooring. A harbour generally has land on three sides and an opening through which ships can pass as they enter the harbour.

A port is located inside a harbour.

Sometimes the words harbour and port are used interchangeably. We should avoid interchanging the words harbour and port.

To harbour means *to give a home or shelter to*. For example: The Kruger National Park harbours wildlife.

So, for ships, natural and man-made harbours give shelter from the open sea.

1.3.1 Harbours

A harbour tends to be a physical area where water meets land and results in a sheltered bay. A harbour may also be man-made by using breakwaters in the open sea.

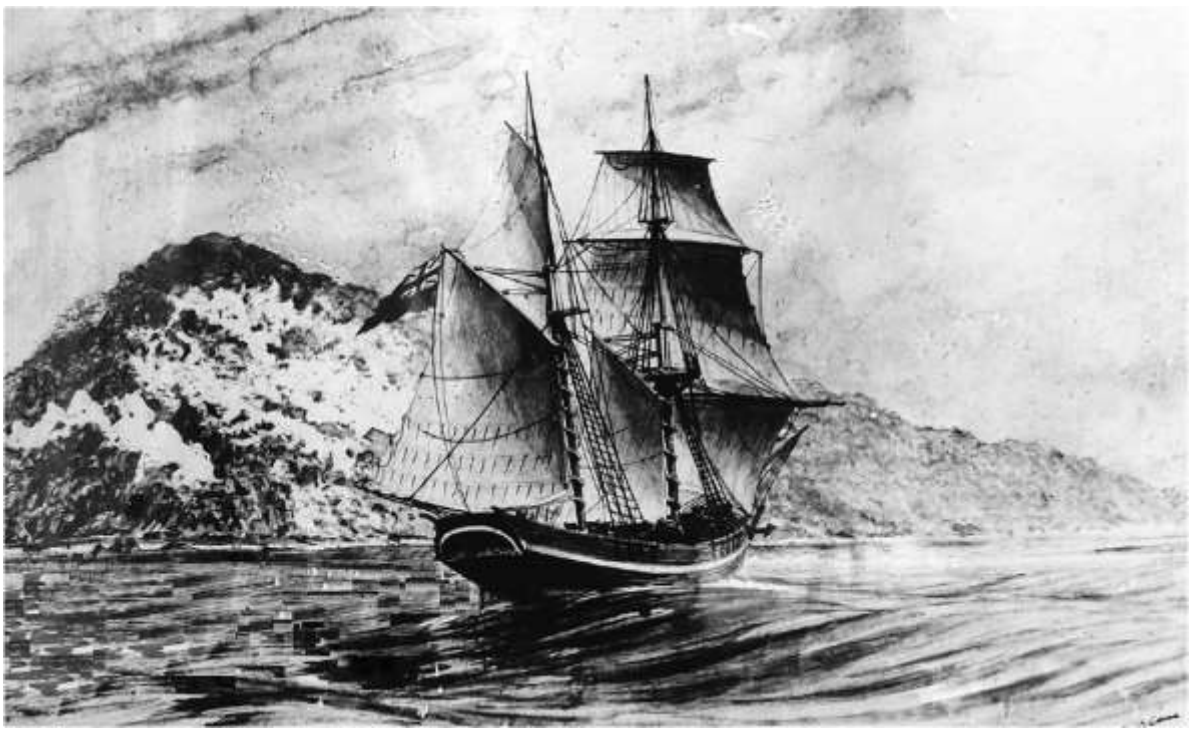


Figure 9: Ship in Durban harbour in 1824 before dredging & breakwaters (adapted from [2])

Task 2:

Consider scene in Figure 9.

2.1 Describe the scene.

2.2. Compare the alongside more recent image of the Durban Habour to that from 1824 in Figure 9. Include any man-made structures in your discussion.

2.2. Was investment into the engineering of a breakwater system and deeper entry into the harbour useful in the long-term?

Man-made harbours cost a lot of money to build, and before a harbour is built, much research is necessary to check that it will be worth the investment to build the harbour. In their research, harbour planners and engineers need to consider a number of factors so that they can be sure that the harbour construction project will be successful, and that the harbour itself will be useful for a long time.

The study resource at http://maritimesa.org/grade-10/the-history-of-cape-town-harbour/ gives the history of the Cape Town harbour.

A summary from the resource is given here.

1.3.2 History of Cape Town harbour

The Portuguese, forerun by Bartholomew Diaz, set anchor in South Africa as a stopover in setting up the route ship route from Europe to Asia.

Did you know:

The discovery of the passage around southern Africa was significant because trade was possible directly with India and the Far East. They could bypass the expensive overland Euro-Asian route.

Did you also know:

Bartolomeu Dias originally named the *Cape of Good Hope* the Cape of Storms (Cabo das Tormentas). It was later renamed (by King John II of Portugal) the *Cape of Good Hope* (Cabo da Boa Esperança) because it represented the opening of a route to the east.

Portuguese fleets successfully rounded the Cape in 1487 and then in 1497. This led to several other fleets passing by the Cape. By the 1650s settlers had begun to build a settlement in the Cape, largely to supply passing ships with fresh food, grain and water.

Figure 10: The Cape in c.1665 (image from [1])

Take a look at the painting in Figure 10. Note the wooden jetty that was used to bring cargoes and passengers ashore from ships anchored in Table Bay. Water in wooden barrels was taken out to the ships at anchor, as shown in the boat in the centre of the painting.

By 1803, despite a number of shipwrecks in Table Bay, especially during the winter when strong north-west and westerly winds and swells drove ships ashore, the only facilities for cargo and passengers were three wooden jetties.

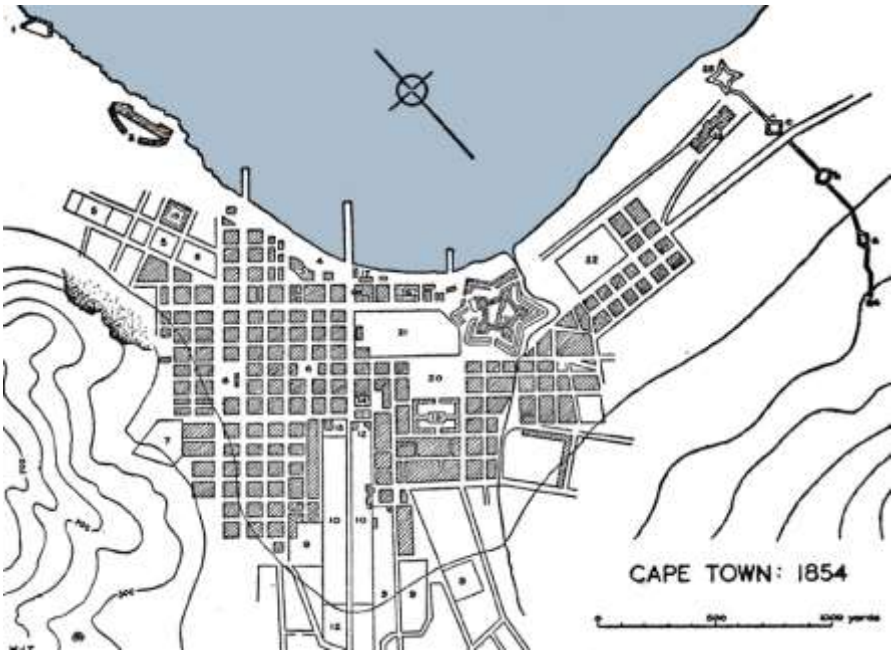


Figure 11: The Cape in 1854 – note the three jetties. (image from [1])

Engineers designed a harbour with a breakwater to protect it from the prevailing swell. Construction work began in 1860, and much of the harbour was dug out of rock, with the breakwater constructed from the dug-out rock. On 17 May 1865, while the harbour was still being built, a severe storm in Table Bay drove 18 ships ashore in one night!

Work on the harbour continued and the breakwater, drydock and slipway for ship repair were completed in 1870. Basic services from the harbour was expanding into wider services. A port was developing in the Cape Town harbour!

The discovery of diamonds in the interior in 1867 led to the "diamond rush" that drew a large number of ships and people from all over the world. This was an impetus to complete the harbour construction work.

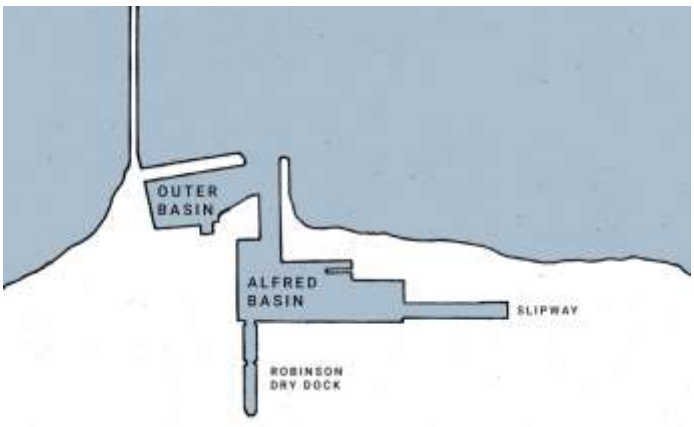


Figure 12: Cape Town Harbour in 1885 (image from [1])

As increasing numbers of ships arrived in Cape Town, the harbour became too small, and had to be extended towards the sea. Over the next few years, the Victoria Basin was constructed, giving ten more berths for ships. Victoria Basin, which is the extension seaward, is shown Figure 13, which is a picture from 1898. Victoria Basin is also clearly shown in the drawing in Figure 14.

Figure 13: Cape Town Harbour in 1898 (image from [1])

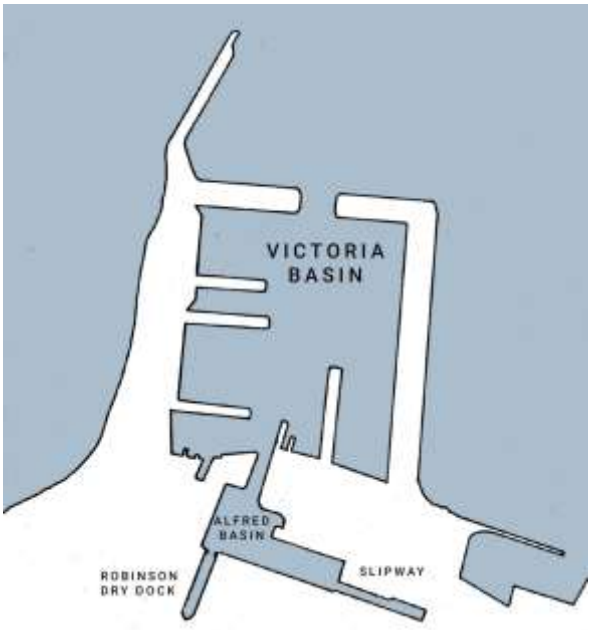


Figure 14: Cape Town Harbour, 1916 (image from [1])

The extension to the harbour gave more berthing space for ships, but two factors meant that further extension was necessary:

- larger ships were entering services to South Africa, making the Victoria Basin too small, and
- by 1929, after an economic slump, trade increased, bringing more ships to Cape Town.

The harbour authorities decided to extend the harbour along the coast and created a new basin, with a "random mole" (a loose collection of concrete blocks and rubble) to enclose the harbour area. This extended section is shown as the NEW BASIN in Figure 15.

Figure 15: Cape Town Harbour in 1937 (image from [1])

Task 3:

The picture below (from [1]) is of Cape Town Harbour in 1937.

3.1. Label jetty 1 and jetty 2 in the Victoria Basin.
3.2. Circle Alfred Basin.
3.2. Indicate the position of Robinson dry dock.
3.3. Label the New Basin.

Because of the large groups of ships (called convoys) that called at Cape Town during World War 2, the New Basin was extended urgently and completed in 1945. The new harbour construction project (later named Duncan Dock, and is shown in Figure 16) included the filling in (reclamation) of large areas that formerly were water to become Cape Town's Foreshore area.

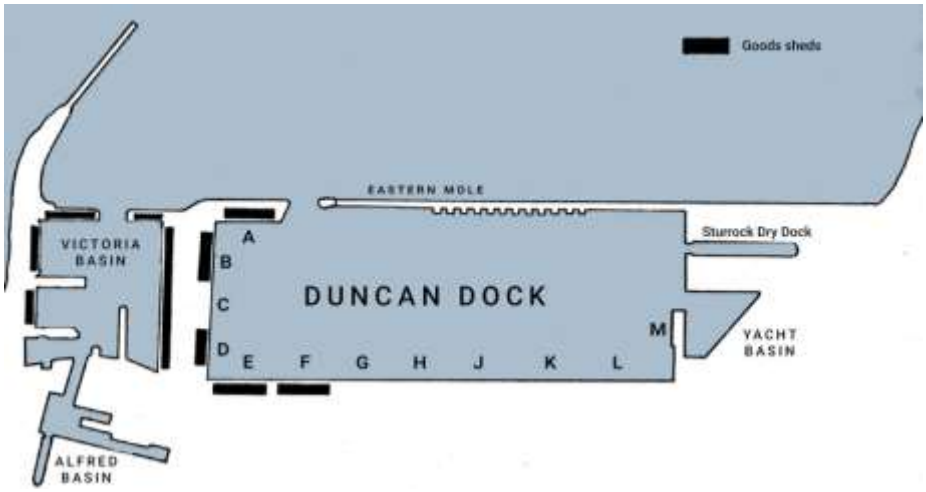


Figure 16: Cape Town Harbour in 1946 (image from [1])

Did you know:

Cape Town harbour's foreshore area has some of the city's tallest buildings.

The new harbour basin had berths E to M, the Eastern Mole and it also had a drydock (Sturrock Drydock) that could accommodate the world's largest ships at the time.

The developments up to 1962 is shown in Figure 17. Note the Tanker Basin (for the import of crude oil for the newly-built oil refinery near Cape Town) and a Lay-up Basin (now known as the Elliot Basin) for the maintenance of small vessels. The Landing Wall (for bunkering and for easier entry for ships to the Sturrock Drydock) and the Repair Quay (for ship repair and maintenance) had also been added. Note also the progressive growth of the harbour from the Alfred Basin (the original harbour, completed in 1870), through the Victoria Basin (completed in 1917) to the Duncan Dock (completed in 1945) to the Tanker Basin (completed in 1962).

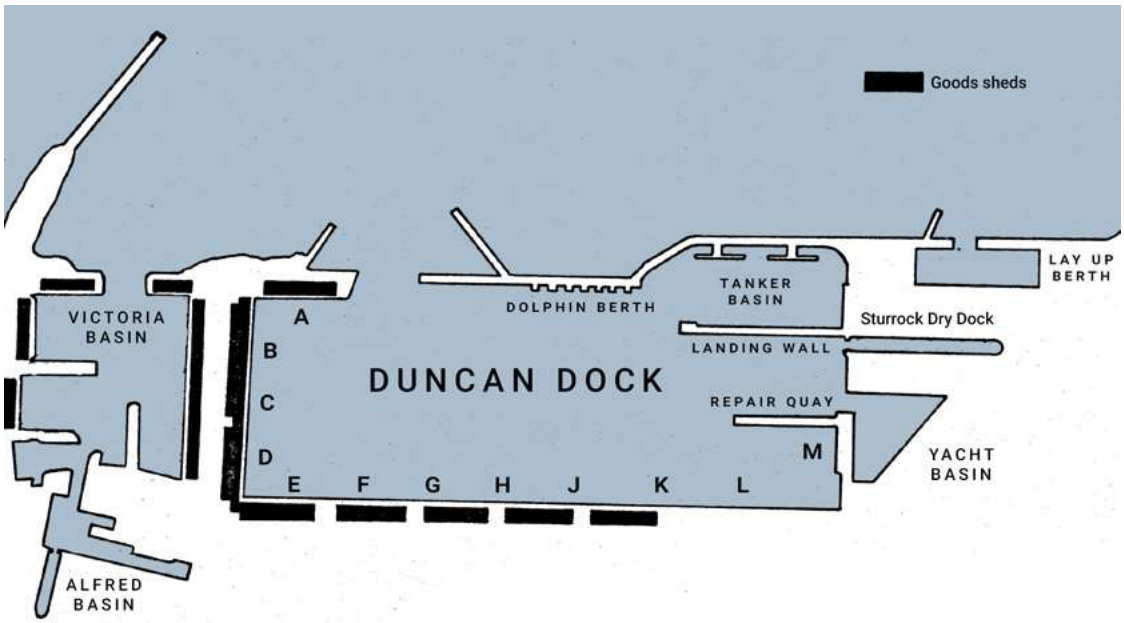


Figure 17: Cape Town Harbour in 1962 (image from [1])

The next development was the **preparation for containerisation** that began officially on 1 July 1977. Not only was a large area required to stack containers before loading onto ships and after landing from ships, but the ships would be longer and have a deeper *draught* than any other cargo ship on the regular trade to South Africa. A new container terminal was built and commissioned in 1977. Figure 18 is an aerial view of Cape Town harbour, taken in June 2006. Note the container terminal as well as Alfred Basin, Victoria Basin, Duncan Dock and Tanker Basin.

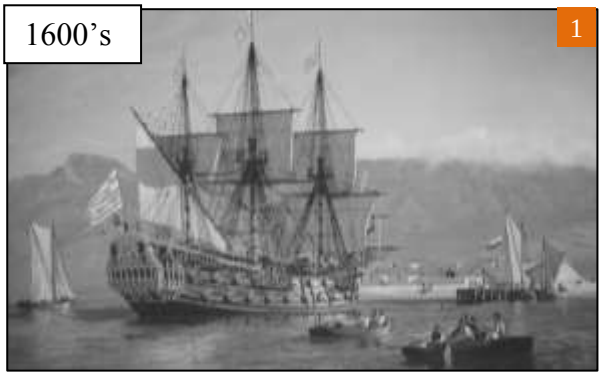
Figure 18: Cape Town harbour and surrounds in June 2006 (image by A. Allen)

In 2007, the Container Terminal was upgraded. The upgrade involved extending and strengthening the concrete surface to allow containers to be stacked higher and therefore increasing the number of containers that can be stacked in the terminal. The Container Basin (called Ben Schoeman Dock) had to be dredged to enable deeper-draughted ships to berth, and eight new gantry cranes have also been installed to speed up container handling.

Self Assessment 5:

Consider the below timeline pictures of Alfred and Victoria basins. Use the rich knowledge which you have gained to describe the transition of use and construction of Alfred Basin. (images are from [1], [3], [4], [5], [6], [7] and [14])

1600's



1800's

1900

1920's

1969

1975

2016

2020

8

Did you know:

- In November 1988, Victoria and Alfred Waterfront (Pty) Ltd ("V&AW") was established as a wholly-owned subsidiary by Transnet Ltd.
- Its aim was to redevelop the historic docklands around the Victoria and Alfred Basins as a mixed-use area with a focus on retail, tourism and residential development with a working harbour at its centre.
- The V&A Waterfront includes restaurants, taverns, specialty shopping, the V&A Hotel, a theatre, arts and craft market, the National Maritime Museum, the Victoria Wharf Shopping Centre, UCT Graduate School of Business, Portswood Square Office Park, BMW Pavilion, Two Oceans Aquarium, Portswood Hotel, Commodore Hotel, City Lodge, Table Bay Hotel and Cape Grace Hotel, Queen Victoria Hotel, Clock Tower District, Nelson Mandela Gateway as well as Zeitz Museum of Contemporary Art Africa (Zeitz MOCAA), which is to be the largest museum of contemporary art from Africa and its diaspora in the past 100 years.

Experiment

Research harbours on the Vaal Dam. These harbours provide safe mooring for small boats. Your school may plan an outing to the Vaal Dam. In this case your excursion should include an interview with an owner or employee of at least one of the marinas. Discover the history of the dam, and the marina. Discover the economic and social impacts which are derived from the marinas. You should deliver your research in the form of an essay. You may include pictures.

Some of the marinas are: Anchor Creek Marina, Cormorant Bay, Harbour Town Vaal Marina, Lake Deneys Yacht Club, Manten Marina, Pennant Nine Yacht Club, Port o Call, Sausalito Boating Club, Stilbaai Yatch Club, Vaal Cruising Association, Vaal Dam, Vaal Marina.

1.3.3 Harbour and port location

Recall from Term 1 that-

- A **port** is a maritime facility and a multimodal distribution hub. It primarily comprises one or more wharves where ships may dock to load and discharge passengers and cargo.
- Ports have an important economic role, both within its surrounds and globally.
- Ports provide:
  - Maritime access;
  - Maritime interface;
  - Infrastructures and equipment; and
  - Land access.
- In section §1.3.2 we have seen how, by expansion and development, the Cape Town harbour had been transformed into having the Port of Cape Town.

Upgrades to harbours and ports are necessary to keep up with the evolving size and type of ships. Shippers, importers, exporters and the end user rely on efficiency of ports to expedite product delivery with minimal incurred costs.

Some of the factors that should be considered for viability to build a harbour and expand port infrastructure include:

- **The major purpose of the harbour and port:** Is the harbour and port to be built to export a particular commodity, e.g. a mineral that is to be mined in the area? Will it be to provide another facility for the fishing industry? Will it be used mainly for container shipping or for vehicle shipments? This type of question needs to be asked to establish the main purpose of the port as well as the type and size of vessel that will use the port. Once its purpose and the type of ships expected to call have been established, the type of facilities within the port can be designed.
- **The sustainability of the expected cargo volumes:** Because the construction of a harbour and ports involves such large expense, a constant flow of cargo must be assured for a long time. If only a small amount of cargo will move through the harbour, it might not be worthwhile to go to the expense of building it.
- **A sheltered site for the harbour:** As ships need to work cargo in calm conditions, harbours need to be constructed to give as much shelter from the swell. Although it is difficult to shelter ships from wind, the alignment of berths might be necessary to reduce the affect of the prevailing wind on ships berthed in the harbour and on cargo operations.
  - To ensure that the harbour is sheltered, it may be necessary to build a number of breakwaters, and some harbours are built out into the sea. Cape Town, Port Elizabeth, Ngqura and Simon's Town harbours are examples of this type of harbour construction. They are known as **Artificial Harbours**.
  - Some harbours are built in a sheltered bay, lagoon or river mouth, and while short breakwaters might be necessary, the cargo wharves are built within the sheltered water area. Richards Bay, Durban, and Saldanha Bay are each built in a sheltered bay, while East London is built on a river. These are known as **Natural Harbours**.
- **Depth of water**: This also depends on the size of ship expected to call. Deep-draughted ships will require an appropriate water depth, but if only small fishing vessels will call, the depth of water need not be as great.
- **Flat land**: For cargo to be stored (either in sheds or in open areas) and for rail or road networks large areas of flat land surrounding the harbour are required.

South Africa has 7 major ports and about 50 other harbours along the coast.
The location of each of the major ports is shown on the map in Figure 19.

1.3.4 Port and other shipping operations

Recall the meaning of shipping operations (from section §1.1):

Commercial shipping operations are organized shipping activities to efficiently deliver goods. Shipping operations includes ship building, ship repairs, ship management, crewing, port infrastructure, aids to navigation, cargo handling, transport corridors and services, insurance, marine safety, marine salvage and voyage planning and costs.

The areal size of a harbour or port depends on the type and volume of cargo to be handled and the type of ship that is expected to call in.

- Mineral cargoes usually need large areas to keep the mineral before loading (this area is called the mineral stockpile).
- Container terminals also need sufficient storage area.
- If large ships are expected to call, there must be sufficient water area to turn these large ships.
- There should also be space for future expansion, and often the initial harbour plans include several possible stages of expansion for the harbour.

The map in Figure 19 shows primary operations for each of the major ports in South Africa.

- Richards Bay provides primary operations for break-bulk and mineral bulk;
- Durban provides primary operations for RoRo, break-bulk, containers and agri-bulk;
- East London provides primary operations for RoRo, break-bulk, containers and agri-bulk;
- Ngqura provides primary operations for containers;
- Port Elizabeth provides primary operations for RoRo, break-bulk, containers and mineral bulk;
- Cape Town provides primary operations for containers, break-bulk and agri-bulk; and
- Saldanha provides primary operations for break-bulk and mineral bulk.

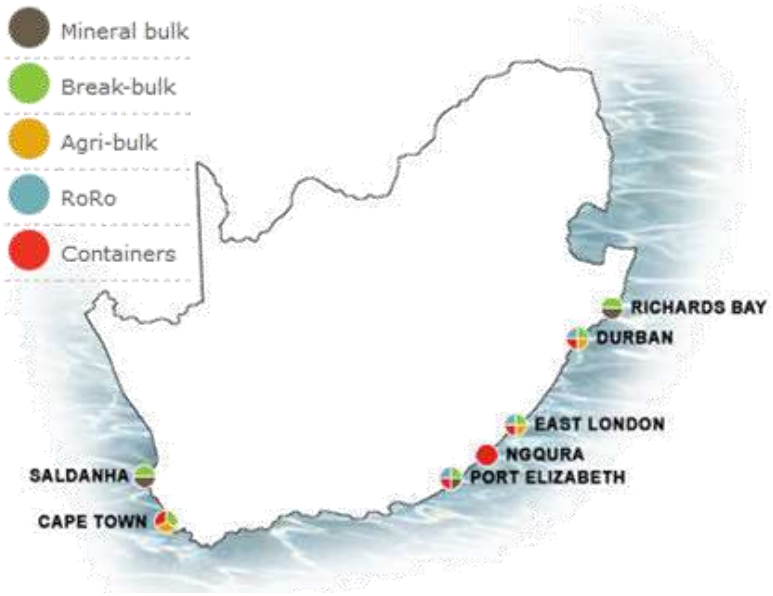


Figure 19: Location of South Africa's 7 major ports (image from [9])

Did you know:

- South Africa has 12 proclaimed harbours, which are undergoing development.
- The scope of work includes: removal of sunken vessels; dredging; repair and upgrades to slipways; shore crane replacements; security installations and apparatus; and civil and electrical infrastructure repairs.
- These operations have an allocation of R402 million.

Besides the topographic and viability factors given the previous section §0, operational factors such as given below must also be considered for development viability and port operation efficiency:

- **Services (water, electricity)**: For cargo handling equipment (cranes, mineral loaders, grain chutes, conveyor systems, pumps), large amounts of electricity are needed. All offices (including the vital port control centre) require electricity for their various electronic systems. Fresh water is also essential as ships often require tons of fresh water.
- **Labour**: A harbour requires workers of all levels of skills – from highly qualified engineers to supervise complex cargo loading machinery, building and harbour maintenance, and electronics systems, to lesser skilled people. Highly qualified and experienced seafarers are also required as harbour masters, pilots, tug engineers, and in other roles where they deal directly with the ships.
- **Transport access**: To move cargo to and from the harbour , adequate road and rail links are essential. Railway yards where trains are marshaled to carry the cargo to its destination are also needed, either at the harbour or close to the harbour. The large numbers of people employed in the harbour also need transport facilities close by.
- **Finance**: To build, operate and maintain a harbour costs a large amount of money. In some countries, the state operates all harbours and therefore the state will fund or subsidise harbour construction. Because of the large costs involved in harbour construction, careful planning is necessary to ensure that the construction project will be financially worthwhile, i.e. that the earnings from the harbour will pay back the costs of its construction within a reasonable time, and that earnings will cover operating costs.
- **Ancillary Services**: A harbour needs a large number of ancillary services, including **pilotage**, tug services, bunkering services, chandling services, **ship repair**, engineering services, waste disposal services, and others. The scale of these services depends on the size of operations in the harbour. A small fishing harbour will require all of these services (except pilotage and tug services), but on a smaller scale than a harbour like Cape Town or Durban where a full range of services extends to operations such as major ship repair and bunkering facilities. The pictures in Figure 20 and Figure 21 are examples of ancillary services.

Figure 20: Ship repair in Robinson dry dock, Port of Cape Town (image from [8])

Did you know:

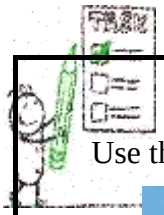
- **Pilotage** is compulsory for all large vessels entering the Port of Durban.
- A helicopter performing most pilot transfers, backed up by pilot boat when the helicopter is unavailable.
- **Recall from Term 1** that a **marine pilot** is a sailor who manoeuvres ships through dangerous or congested waters, such as harbours or river mouths. They are navigational experts possessing knowledge of the particular waterway such as its depth, currents, and hazards**.**

Figure 21: A pilot preparing to board a vessel by helicopter outside Durban Harbour (image from [11])

Did you also know:

- A tugboat maneuvers big vessels by pushing or pulling the big vessel.
- Most harbours prohibit ships from self-maneuvering in the harbour.
- Although the tugboat is handled by a tug master, there needs to be effective communication to avoid accidents.
- There needs to be good communication between the tug master and the port authorities to keep updated on hazards and traffic movements.
- There needs to be good communication between the tug master and the towed vessel.
- All personnel have agreed hand signals and communication equipment must be checked.

Figure 22: A containership being turned by a tug so that she can berth starboard side to (image from [1])



Task 4:

Use the below map and identify some of the operations in the Port of Cape Town.

1.3.5 Port management structures

Port management structures may vary according to the size of the harbour, the number of ships calling, and the particular requirements of the harbour. A harbour for merchant ships typically has two divisions:

- The **Marine Division** is responsible for the safe movement and mooring of ships as well as marine services in the harbour such as vessel control, pilotage, tug services, dry-docking, bunkering, harbour security, buoyage and other navigational aids.
- The **Harbour Management Division** is responsible for the administration of the harbour, all the land area belonging to the harbour, harbour equipment and machinery, harbour buildings, the financial management of the harbour, and the marketing of the harbour.

The typical rank structure of the marine division of a harbour is as shown in the diagram in Figure 23.

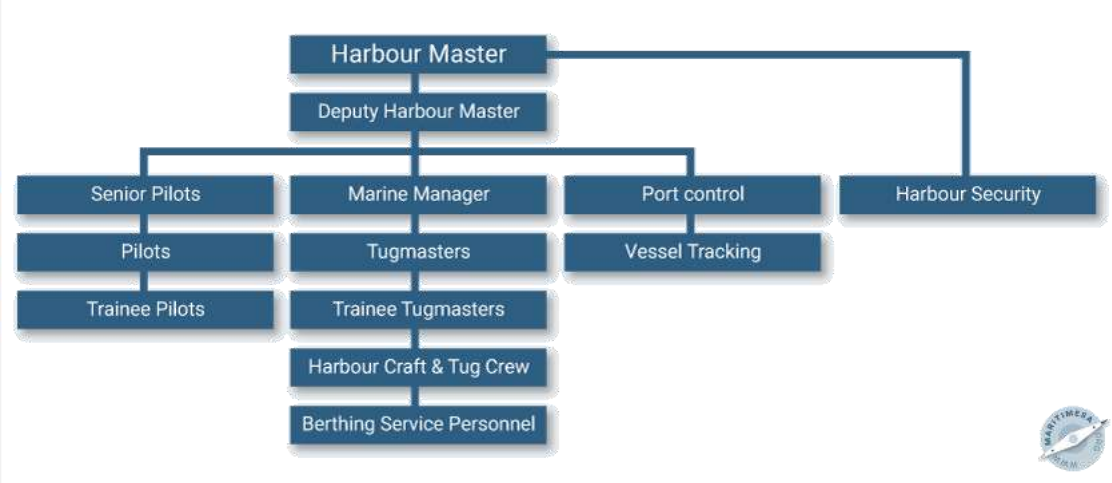


Figure 23: Typical harbour marine division rank structure (image from [1])

The below list is the Harbour Masters at the 7 major ports in South Africa, as on June 2018.

Capt. Precious Dube  (Richards Bay)	Capt. Sabelo Mdlalose  (Durban)	Mzukisi Nqwata  (East London)	Capt. Thulani Dubeko  (Ngqura)
Capt. Brynn Adamson  (Port Elizabeth)	Capt. Alex Miya  (Cape Town)	Capt. Quenton Brink  (Saldanha)	

Did you know:

- A harbour master is an official responsible for enforcing the regulations of a port.
- The harbour master has to ensure the safety of navigation, the security of the harbour and the correct operation of the port facilities.
- The harbour master may have legal power to detain, caution or even arrest persons committing an offence within the port or tidal range of the port's responsibilities.

1.3.6 Rejuvenation of derelict harbour zones

Harbours and ports are gateways to trade and as such are a natural focus for upgrade and expansion. Harbour zones, which do not meet the needs for current shipping, can become derelict.

We have seen with the history of Cape Town harbour that international shipping demands led to expansion of the harbour from Alfred Basin into Victoria Basin, then into Duncan Dock and then into Ben Schoeman Dock. This expansion led to the shift in primary activities from Alfred and Victoria basins into the other docks. The older areas within the harbour became disused, and developed into unattractive places as many of the buildings were no longer used and these parts of the harbour became rather unsightly.

Notable shipping changes that can force upgrades and expansions to a port and which can lead to the disuse and dereliction of harbour zones include:

- Increasing vessel sizes;
- Increasing vessel traffic;
- Space for additional berthing;
- Storage space;
- Space for fixed facilities;
- Technology automation;
- Internet of things (IoT) sensors;
- New disruptive technologies; and
- Towards zero emission shipping.

In Cape Town, the Victoria and Alfred Waterfront project transformed the derelict zones into thriving tourist attractions.

Did you know:

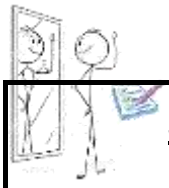
The Victoria and Alfred Waterfront project led to:

- Old buildings transformed into smart hotels.
- An old fishing store turned into an expensive hotel.
- An old quarry which was used for fuel storage has become a small craft harbour.
- Old grain silos have become a world-class art gallery and hotel.

Figure 24: Area around Durban Point before Ushaka Marine World, 2001

Figure 25: Area around Durban Point with Ushaka Marine World, 2019

A similar project has been undertaken at the Point area of Durban harbour where old, derelict buildings have either made way for modern, upmarket functions, or have been converted to prestigious flats or offices. uShaka Marine World, a marine leisure park, has been built in part of the once dilapidated Point area.



Self Assessment 6:

Spot two differences between the pictures in Figure 24 and Figure 25.

Experiment

Use Google Earth and its historical imagery to zoom into areas at the Durban Point.

You will spot canals, the esplanade and new buildings. You can also take yourself on a virtual tour through uShaka Marine World and the Durban harbour.

Did you know:

One of the most extensive harbour rejuvenation projects has been that of the **London Docklands** where old warehouses and cargo sheds have been demolished and replaced with upmarket residential blocks and offices. Many of the old harbour wharves have been retained and are now pedestrian walk-ways.

Figure 26: London Docks before and after rejuvenation (image from [15])

Task 5:

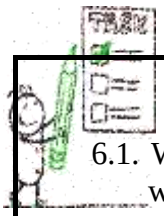
5.1. Give a reason for harbour zones being at risk of dereliction.

5.2. Besides rejuvenation for tourism, what are other purposes for rejuvenation of a derelict harbour zone?

1.4 Major shipping companies

According to 2019 review of maritime transport by the United Nations Conference on Trade and Development (UNCTAD, the top thirty-five **ship owning economies** as at 1 January 2019, were as listed in the table below. This list considers all types of merchant vessels.

Country	Fleet size	DWT	Country	Fleet size	DWT
1. Greece	4 536	349 195 189	19. Russia	1 707	22 747 486
2. Japan	3 822	225 121 215	20. Indonesia	2 145	22 294 926
3. China	6 125	206 301 032	21. Netherlands	1 195	18 151 246
4. Singapore	2 727	121 485 648	22. UAE	913	18 107 929
5. Hong Kong	1 628	98 128 318	23. Saudi Arabia	284	18 092 485
6. Germany	2 672	96 532 360	24. Iran	236	17 909 265
7. Rep. of Korea	1 647	76 701 517	25. Italy	692	17 862 208
8. Norway	2 038	61 115 099	26. Brazil	401	13 667 582
9. United States	1 975	58 377 706	27. France	435	13 234 262
10. Bermuda	532	58 232 207	28. Cyprus	300	11 027 397
11. Taiwan	1 005	51 091 107	29. Vietnam	1 020	9 633 356
12. United Kingdom	1 327	48 673 337	30. Canada	373	9 097 752
13. Denmark	980	43 004 271	31. Malaysia	599	8 732 293
14. Monaco	448	42 277 013	32. Oman	49	7 877 136
15. Belgium	298	30 166 459	33. Qatar	131	7 021 303
16. Turkey	1 522	27 609 712	34. Thailand	406	6 863 891
17. India	1 019	24 859 163	35. Sweden	298	6 614 477
18. Switzerland	435	24 638 053			



Task 6:

6.1. What is the capacity of the total fleet within Malaysia? Write your answer out in words.

6.2. How many merchant vessels are owned by Swiss?

6.3. Does Switzerland have access to the sea or is it a landlocked country?

6.4. If Switzerland does not have direct access to the ocean or sea, why do the Swiss own merchant vessels?

In consideration of only the deep-sea container shipping lines, the below is the list of top ten **shipping companies** in the world.

	Name of Company	Country	Fleet size	Fleet Capacity in million TEU
1	A.P. Møller–Maersk Group	Denmark	707	4.2
2	Mediterranean Shipping Company (MSC)	Italy	566	3.8
3	China Ocean Shipping Company (COSCO)	China	503	2.9
4	CMA CGM Group	France	492	2.7
5	Hapag-Lloyd	Germany-Chile	236	1.7
6	Ocean Network Express (ONE)	Singapore	222	1.6
7	Evergreen Marine Corp.	Taiwan	200	1.3
8	Yang Ming Marine Transport Corporation	Taiwan	101	0.6
9	Pacific International Line (PIL)	Singapore	120	0.4
10	Hyundai M.M	South Korea	67	0.4

Self Assessment 7:

How is it possible that PIL and Hyundai M.M have the same fleet capacity, yet PIL has 67 more vessels than Hyundai M.M.

1.4.1 Some shipping companies that operate within South Africa

Shipping companies that operate within South Africa include:

- Maersk Line
- Mediterranean Shipping Company (MSC)
- Safmarine
- Evergreen Shipping
- Mitsui-OSK Line (MOL)
- Maritime Carrier Services (MACS)
- K Line
- Deutsche Afrika Linien
- Pacific International Line
- BP Tankers
- Grindrod
- Smit Amandla Marine
- Nile-Dutch Shipping
- Vuka Marine
- Nduna Maritime
- Linsen Nambi

1.4.1.1 Vuka Marine

Vuka Marine is a South African owned shipping company. The is a joint venture between South African Via Maritime Holdings and Kawasaki Kisen Kaisha Ltd (K-Line), of Japan.

Vuka Marine owns three capesize bulk carriers. These bulkers are *Cape Enterprise*, *Cape Orchid* and *Windsor Adventure*. All three vessels carry the national flag. This means that **the vessels are registered in South Africa**.


Cape Enterprise


Cape Orchid


Windsor Adventure

1.4.1.2 Nduna Maritime


Bow Cecil

Nduna Maritime is a subsidiary of the Mnambithi Group, which is involved in bulk liquid shipping, terminal operation in Durban, and coal mining.

Nduna Maritime and Sasol had entered into an enterprise and supplier development (ESD) funding agreement to acquire the chemical tanker, *Bow Cecil*. *Bow Cecil* is South Africa's first oil/chemical tanker. The vessel cost R400 million and can carry 37,000 deadweight tons of cargo. It is equipped with 47 tanks. Along with exporting goods to Asia, the vessel also handles inbound shipments of vegetable oils, caustic soda, phosphoric acid, and other chemical products for companies such as Omnia, PetroSA, and Sappi.

Bow Cecil is **flagged in Norway** and is operated by Odfjell Management AS.

1.4.1.3 Maersk Line

Based in Copenhagen, Denmark, Maersk Line is the world's largest containership operator and move cargo between most countries, either by direct services or by moving containers to hub ports for onward shipment by feeder vessels or by road or railway.

1.4.1.4 Smit Amandla

Smit Amandla Marine is a South African company that was formed in 2004 to operate the emergency towing vessel contract that the company has held (via its predecessor companies) since 1977. Over the years, the company has broadened its operations to include ship bunkering, for which purpose it operates two bunker barges in Durban and one in Richards Bay where they deliver marine fuels to vessels in port.

The company also offers ship management. Among the vessels managed and crewed by Smit Amandla is the South African polar supply and research vessel, *SA Agulhas II*.

The company manages the supply vessels *Sea Carrier* and *Sea Express*, both of which carry supplies to the offshore diamond recovery vessels that operate around Port Nolloth.

Smit Amandla also operates in Mozambique where, among other roles, the company provides towing services at the port of Beira. Here, *lighters* loaded with coal are towed to ships anchored off the port.

1.4.1.5 Grindrod

Grindrod & Company was established in 1910 by Captain John Grindrod. The company served as a clearing and forwarding agency and also offered marine surveying. By 2012 the company grew to include ship's agency work, ship chandling and coaling.

Present day Grindrod is listed on the Johannesburg Stock Exchange (JSE) and has its head office in Durban. Grindrod has a number of subsidiary companies, joint venture and associated companies in 43 countries worldwide, employing more than 7 500 skilled people. Grindrod's present business involves the movement of cargo by road, rail, sea and air, through integrated logistics services. Its shipping division focuses on the movement of drybulk and bulk liquid commodities, containerised cargo and vehicles.

Grindrod owns a fleet of 17 handysize bulk carriers, 8 supramax/ultramax bulk carriers, 5 medium range (MR) products tankers, and 2 small product tankers.


Image: mfame.guru


Image: marinelink.com


Image: maritimesa.org

Task 7:

(from http://maritimesa.org/grade-10/grindrod/)

Read this modified from an article in Maritime Southern Africa, November-December 2010. Then answer the questions set at the end of the article.

"My bicycle took me to No 6 Quay (a berth for coasters in Cape Town harbour) where I found barrels of lube oil and paraffin, a range of household goods and occasionally someone's car waiting to be loaded aboard a Thesen coaster for one of the small west coast ports where draught was a limiting factor for shipping at those harbours.

Some of those vessels were small - less than 50 metres - while some of the Durban-based coasters had steamed through 30 winters by the time African Coasters bought them. I recall the 40-year old Bulwark and Range, similar straight-stemmed vessels with tall, narrow funnels; there were Barrier and Margin that carried cargo along the coast from the mid-1950s to the early 1960s when they were scrapped in Durban to make way for modern vessels. (Bulwark had been wrecked at Danger Point in 1963, and Margin had a near-miss when she curiously grounded on Neptune Beach in Algoa Bay, but fortunately, the Port Elizabeth tugs CF Kayser and John Dock pulled her off the beach.)

The 1947-vintage Voortrekker held a special place in the company for she was custom-built for the trade to Port Elizabeth.

An integral part of African Coasters was the Grindrod family whose involvement in local shipping

extends back to a small ships' agency, coaling and forwarding company that Captain John Grindrod established in Durban a century ago.

A major step forward was the merger of African Coasters and their rival Smith's Coasters and the subsequent formation of Unicorn Lines in 1964. The Thesen ships were also added to the Unicorn operation, and the expanded, revitalised company began to modernise its fleet, especially to move paper from Durban to Cape ports.

The company pioneered containerised coastal shipping along the South African coast when it chartered the small Ro-Ro vessel Voorloper in 1971. A shipbuilding programme in Durban produced the 60-metre Oranjemund for the Port Nolloth trade, three 4000-deadweight coasters, four cargoships, two 394-teu containerships to run feeder cargoes along the coast, and a rig tender for the offshore operations south west of Mossel Bay.

I was aboard Kowie, a 8676-deadweight multi-purpose ship that, with her sister, Nahoon, and some of the Trampco ships, was on the weekly Durban-Cape Town service in 1982-83.

For a while, Unicorn used Ro-Ro shipping, initially to move only vehicles and then came the two large Ro-Ro vessels Border and Barrier. On a voyage aboard Border, I remember being so close to the picturesque Wild Coast that features like Hole-in-the-Wall or the beautiful Iron Gates at Port St Johns were clearly visible. I thought of the original Border and her consort Frontier of less than 35 metres that plied the Durban-Port St Johns route in the early days of the company. They sometimes stranded on the unpredictable bar, and were refloated by teams of oxen!

Grindrod has grown phenomenally and has diversified since those days of the early coasters, venturing successfully into dry bulk and liquid bulk terminals, road transport, container depots, forwarding and clearing, logistics, trading, bunkering and banking. Its ships' agency division has expanded through the acquisition of a number of agencies, some of which began even before the advent of Grindrod and Company in 1910, and who serve some of the leading shipowners on the South African trade.

The Cape Town offices of King & Sons, Mitchell Cotts and Ellerman & Bucknall were among those I badgered, in my younger days, for post cards of the ships they serviced, and usually, someone looked kindly on me, delved into a drawer and produced a wad of postcards of Bullard King ships, Port Line freighters, or Shell tankers, or the famous City ships. After a successful trip to town, I would scuttle off home to add my newly-acquired postcards to my growing collection in which you will still find those provided by the kind folks in the agencies that are now part of the Grindrod stable.

The largest component in Grindrod remains its shipping division, strengthened by a massive - and far-sighted - capital commitment to tanker construction, initially in Poland during the 1990s, and more recently in Korea and China. Three bunker tankers are also in service, two built in China and one in Durban.

The significant purchase of Island View Shipping in 1999 led to the group benefiting from the extraordinary freight and charter rates that prevailed from 2002 to 2008, catapulting share prices to unprecedented levels.

The company's early coastal shipping operation has evolved to Ocean Africa Container Line that moves feeder and coastal cargoes between ports ranging from Luanda to Mozambique.

Although world shipping markets have tumbled recently, shareholders nod with appreciation that astute management has ensured that the 40 owned ships and those that the company has taken on long-term charter have been fixed on favourable terms.

Central to its hundred years of operations has been the Grindrod family, and most remarkable was the role of the late Murray Grindrod, grandson of the founder. For half of the company's existence, Murray Grindrod worked in various roles, starting at Maydon Wharf where the old coasters used to load their sugar, paper and detergent cargoes, and later he moved up the ladder to lead his dynamic management team until his retirement as chairman in 2007. Although he passed away in 2015, his commitment and personal integrity remain hallmarks of the company.

More than 50 summers have passed since my schoolboy adventures along South Arm as the coasters berthed and sailed. In that time, Grindrod has moved on considerably, developing into a multi-faceted international company, operating dozens of ships, with terminals in Maputo and Walvis Bay, and with offices in several foreign centres. A remarkable record!"

7.1. List all the cargoes that are mentioned in this article.

7.2. Write down three interesting aspects of the trade from Durban to Port St Johns.

7.3. From the article, what would you say is the most remarkable aspect of the growth of Grindrod over the years. Explain your choice of aspect for your answer.

7.4. Among all shipping people in South Africa and abroad, Mr Murray Grindrod was a highly respected gentleman. What characteristics do the article list that would have contributed to that level of respect accorded to Mr Grindrod?

1.4.1.6 Linsen Nambi


Image: Rising Sun Overport

Thuso Mhlambi and Durand Naidoo are childhood friends who, from a young age had planned to open a company. They founded Linsen Nambi in 2012. The company's vision is to "*become the leading African shipping company with a global presence*" and is based in Durban.

Linsen Nambi specialise in ship broking, chartering, logistics, supply chain management, and bunker services. The bunker services division, alone, generates about USD4 million in sales.

By 2018 Linsen Nambi employed 110 people. The, then 33-year-old, owners made maritime history as youth owners when they bought Grindrod's Unicorn Bunker Services. They also became a role model in unlocking transformation by partnering with Women in Oil and Energy (WOESA).

By August 2018 Linsen Nambi owned three bunker vessels, namely *The Fumana*, *Southern Venture* and ???. The company has delivered in excess of 10 million tons of marine fuel and to more than 20, 000 ships.


Image: linsennambi.com

Figure 27: Fumana and Southern Venture berth alongside Queen Mary 2 to bunker the 345 meter long passenger ship.

Did you know:

Linsen Nambi's bunker vessel, **Fumana** was built in 2010 by the South African ship building company called Dormac Marine Engineering. The vessel is 69 m long, 17 m in breadth and has a deadweight of 4,250 tons.

The Department of Transport's Comprehensive Maritime Transport Policy (CMTP) for South Africa covers all types of infrastructure to support movements of goods and people; off-shore industries and is concerned with creating the conditions for a safe, secure and stable environment within which all national maritime assets can develop and be utilised for the socio-economic growth and prosperity of the nation whilst being of service to international shipping and trade.

1.5 Marine salvage

Marine salvage is the process of recovering a ship and its cargo after a shipwreck or other maritime casualty. It is also the saving of a ship and/or her cargo from imminent danger.

In order to safeguard those that work within the shipping industry and those that might be affected by an accident, more than 30 conventions (rules) control the shipping industry worldwide. The International Maritime Organisation (IMO) sets these international regulations.

The conventions (rules or regulations) cover all aspects of international shipping, like:

- vessel registration,
- vessel design,
- vessel construction,
- vessel equipment,
- vessel manning,
- vessel operation, and
- the prevention of pollution.

IMO member states are responsible for implementing the conventions. South Africa is an IMO member state and the South African Maritime Safety Authority is tasked (mandated) with the administration of maritime conventions which are adopted by the country.

Did you know:

Following from local and international rules for maximising safety, ships must undergo survey and have certificates to prove sea-worthiness and compliance to safety measures.

Some of the certificates (after survey) which are required for the chemical carrier *Bow Cecil* to be considered safe for operation include:

- Brake Test
- Derricks/Cranes
- Foam Supply
- Ropes
- Cargo Ship Safety Construction (SCC)
- Cargo Ship Safety Equipment (SEC)
- Cargo Ship Safety Radio (SRC)
- Certificate of Fitness (COF)
- Certificate of Insurance (H&M)
- Certificate of Insurance (P&I)
- Civil Liability for Bunker Oil Pollution Damage Convention (CLBC)
- Civil Liability for Wreck Removal (WRC)
- Confirmation of Compliance - Ship Fuel Oil Consumption
- Crew Accommodation
- Declaration of Company Security Officer (CSO)
- Declaration of Designated Person Ashore (DPA)
- International Air Pollution Prevention (IAPPC)
- International Anti-fouling System (IAFSC)
- International Ballast Water Management (IBWM)
- International Energy Efficiency (IEEC)
- International Oil Pollution Prevention (IOPPC)
- International Sewage Pollution Prevention (ISPPC)
- International Ship Security (ISSC)
- ISM Safety Management (SMC)
- LRIT Compliance
- Minimum Safe Manning (MSM)
- MLC Shipowners Liability
- Ship Radio Station License (SRL)
- Shipboard Marine Pollution Emergency Plan (SMPEP)
- U.S. Certificate of Financial Responsibility (COFR)
- USCG Certificate of Compliance (USCGCOC)
- Vapour Emission Control System Certificate (VECS)
- War Risk Insurance Policy (WRIP)

International Loadline Certificate (ILC).

Accidents and dangers do occur. The danger can be the result of:

- Breakdown of machinery
- Hull fracture/damage
- Fire/Explosion
- Grounding
- Sinking
- Collision

Salvage operations are usually conducted in terms of a **Lloyd's Open Form (LOF)**. This means that a stricken ship must accept an offer of salvage from a salvor and a binding contract is entered into between the salvor, the ship owner and/or the cargo owners.

Lloyd's Open Form (LOF) is a contract for a proposed marine salvage operation.

IMO requires every ship to help any nearby ship in distress. The shipmaster has an obligation to render assistance to those in distress at sea without regard to their nationality, status or the circumstances in which they are found.

On the other hand, so long as the owner or his agent remains on the distressed ship, unwanted offers of salvage may be refused.

Traditionally, the salvage reward has been subject to the salvor successfully saving the ship or cargo, and if neither is saved, the salvor gets nothing, however much time and money has been spent on the project. This harsh principle is called "**No cure – no pay**". The LOF may include a **SCOPIC**, which **is a "safety net" to ensure a minimum payment to the salvor** in difficult cases to soften the demanding salvage principle of "no cure no pay".

A salvage operation may involve:

- Refloating a ship that has gone aground
- Pumping water from a ship that has suffered an ingress of water
- Extinguishing a fire
- Keeping a ship afloat when otherwise she would have sunk
- Clearing a wreck from a harbour
- Removing a wreck from the coast
- Reducing a wreck when it is impossible or too costly to remove the wreck
- Cargo Recovery (This sometimes needs to be done quickly because the cargo is toxic or will pollute the coastline.)
- Removal of bunkers or toxic/pollutant cargo from a damaged ship

Task 8:

8.1. Consider the artificial situation depicted in the cartoon below.

8.1.1. Describe the situation that is being depicted.

8.1.2. Does the ship owner on the stricken vessel have a legal right to deny being rescued by the approaching vessel?

8.1.3. Is Ship Master Longa obligated to respond if a distress call had been made by the stricken ship?

8.1.4. A closed lifeboat is shown on the stricken vessel. In your opinion, what are some of the advantages of closed lifeboats?

8.1.5. In your opinion, based on the situation shown, should the captain of the stricken vessel order to abandon ship? What do you see as a problem if the ship is to be abandoned?

The below questions are from http://maritimesa.org/grade-10/basic-principles-of-marine-salvage/.

8.2. Read through the following descriptions of maritime incidents. Which of these incidents can be regarded as SALVAGE and which can be regarded as OCEAN TOWAGE?

8.2.1. A ship breaks down 250 nautical miles off the coast. The weather is calm and the ship is not in danger of sinking or of going aground. A tug takes the ship in tow and brings her safely to Cape Town.

8.2.2. A ship goes ashore near Port Elizabeth. A tug tries to tow her off the beach at high tide, but the attempt fails. The tug owner decides to wait ten days until the next spring high tide; in the meantime, the ship's bunkers and some cargo are removed, and the tug manages to pull her off the beach on the spring high tide.

8.2.3. A ship suffers a fire in her engineroom, two nautical miles off the KwaZulu-Natal coast, and is immobilised. A gale force onshore wind is blowing. A tug manages to connect a towing line and tows the ship to Durban.

8.3. Read the following extract and answer the questions set. It relates to an incident off the Eastern Cape coast in September 2015. The rig *Pentagon 5000* had been under from Ngqura by the tug Indus. They were heading for Mauritius when the tug had difficulty making headway in the current. The towing line parted, and the rig was drifting in the current and at one stage was in danger of going ashore. The salvage tug Smit Amandla was sent from Cape Town to take the rig in tow and return her to Ngqura on Algoa Bay.

"After a protracted wait for a helicopter to put a salvage team aboard the drifting rig Pentagon 5000 to connect the towing line, the salvage tug Smit Amandla took the rig in tow off the southern coast, and headed for Algoa Bay. The line parted, was reconnected and the difficult tow continued.

At the time of writing, it was not clear whether Ngqura would accept the rig as two others are already in port, and, with a third one alongside, the harbour tugs would be stretched if a violent wind threatened to rip the rigs from their moorings. The uncertain future of the rig might also add to the port's reluctance to accommodate her. Like Orca, a rig now idle off Mossel Bay, she might be anchored indefinitely in Algoa Bay.

The ten-day saga highlighted several inadequacies in maritime safety, especially as underpowered tugs continue to move some large vessels along the coast, and emergency helicopter services are in short supply when needed. What if the rig had been drifting towards the coast, or worse, what if the casualty had been an abandoned tanker or another ship with full bunker tanks and drifting shoreward in wild weather – but no helicopter was available to airlift salvors aboard?

At its peril, the country continues to ignore the need for proper maritime helicopter rescue services and maritime aerial patrols, despite increasing numbers of ships passing the Cape. The former service is currently conducted in most cases by the National Sea Rescue Institute's intrepid volunteer crews who risk their lives to bring injured or ill seafarers ashore by launch in all weathers. The latest medical evacuation was rendered off Port Elizabeth when the local launch brought ashore the Filipino cook from the Capesize ore carrier Spring Hydrangea, en route from India to Brazil.

The apparent downscaling of the air force comes at a time when helicopters should be on standby in all ports for rescue operations and to counter the growing menaces of poaching and drug running along the coast. If the depleted air force is not available for this essential work, or to assist with salvage operations, civilian helicopters should be contracted for 24/7 emergency standby."

8.3.1. What are the roles that helicopters can play in maritime activities, including during salvage operations?

8.3.2. Explain why the port of Ngqura may not want the rig to berth there.

8.3.3. What difficulty would the NSRI crew have had getting the ill cook from Spring Hydrangea?

8.3.4. Assume the salvage tug, *Smit Amandla*, was on daily hire at US$16000 a day. If she left Cape Town at 00:01 on 24 August, took a full day to reach the rig, and had to wait for three days to put a line aboard the rig, and that the tow to Ngqura took two days, and she had to wait three days for the wind to drop before the rig could enter the port.
8.3.4.1. How many days was she on hire from the time she left Cape Town?

8.3.4.2. How much (in US dollars) would the tug's owner receive for the operation?

8.3.4.3. How much (in South African rands) would the South African office of the tug's owner receive if the exchange rate at the time was US$1 = R13.04?

1.6 Sample of voyage costs

There are a number of costs relating to operation of a vessel. These costs include fixed costs such as capital costs and running costs (crew, maintenance and repairs, insurance, administration), as well as voyage costs. **Our focus in this section is on voyage costs**.

1.6.1 Calculating voyage duration

When calculating the cost of a voyage, it is important to find out how long a ship will take to travel from one port to another. In these calculations, the distance between the ports and the average speed of the ship are important.

$$\text{Time to reach Destination Port} = \left(\frac{1}{24\text{ hours}}\right) \cdot \left(\frac{\text{Distance to Destination Port in nautical miles}}{\text{average speed of the ship in knots}}\right)_{\text{in hours}}$$
$$= \text{time to reach destination port in days}$$

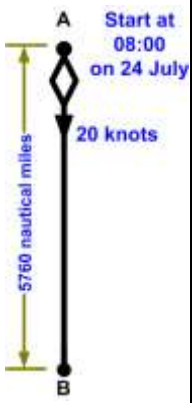
Note the quantity dimension:

$$\frac{\text{nautical miles [M]}}{\text{[knots]}} = \text{[hours]}$$

Also, with 24 hours in one day we divide the total hours by 24 hours to get our answer in total number of days.

Example 1 *(from http://maritimesa.org/grade-10/calculating-voyage-duration/)*

A ship leaves Port A at 08:00 on 24 July and is heading to Port B at an average speed of 20 knots. The ship will need to travel a distance of 5760 nautical miles. The ship master will need to inform his agent when the ship will arrive at Port B, and he will need to calculate her Estimated Time of Arrival (ETA). *(Assume that Port A and Port B are in the same time zone)*



Solution:

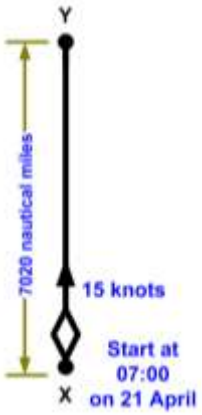
The diagram alongside illustrates the situation.
We have:

$$\text{Time to reach Port B} = \left(\frac{1}{24\text{ hours}}\right) \cdot \left(\frac{\text{Distance to Port B in nautical miles}}{\text{average speed of the ship in knots}}\right)_{\text{in hours}}$$
$$= \left(\frac{1}{24\text{ hours}}\right) \cdot \left(\frac{5760\text{ M}}{20\text{ knots}}\right)_{\text{in hours}} = \frac{288\text{ hours}}{24\text{ hours}} = \underline{12\text{ days}}$$

$$\text{ETA at Port B} = \text{Sailing time} + \text{time of voyage} = 08{:}00 \text{ on 24 July} + 12 \text{ days}$$
$$= \underline{08{:}00 \text{on 5 August}}$$

Example 2 *(from http://maritimesa.org/grade-10/calculating-voyage-duration/)*

A ship leaves Port X at 07:00 on 21 April and is heading to Port Y at an average speed of 15 knots. The ship will need to travel a distance of 7020 nautical miles to get to Port Y. What is her Estimated Time of Arrival (ETA) at Port Y? *(Assume that Port X and Port Y are in the same time zone)*



Solution:

The diagram alongside illustrates the situation.

We have:

$$\text{Time to reach Port Y} = \left(\frac{1}{24\text{ hours}}\right)\cdot\left(\frac{\text{Distance to Port B in nautical miles}}{\text{average speed of the ship in knots}}\right)_{\text{in hours}}$$

$$= \left(\frac{1}{24\text{ hours}}\right)\cdot\left(\frac{7020\text{ M}}{15\text{ knots}}\right)_{\text{in hours}} = \frac{468\text{ hours}}{24\text{ hours}} = \underline{19.5\text{ days}}$$

$$\text{ETA at Port Y} = \text{Sailing time} + \text{time of voyage} = 07{:}00 \text{ on 21 April} + 19.5^{*} \text{ days}$$

$$= \underline{19{:}00 \text{ on 10 May}}$$

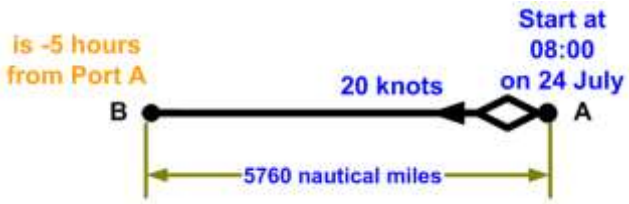
*19.5 days = 19 days 12 hours

Example 3 *(from http://maritimesa.org/grade-10/calculating-voyage-duration/)*

Consider Example 1. Now assume that Port B is in a time zone that is 5 hours behind the time zone for Port A. What will be the ship's ETA at Port B.

Solution:

This situation is illustrated in the diagram alongside.



The ship's ETA at Port B will be 5 hours behind the time calculated in Example 1.

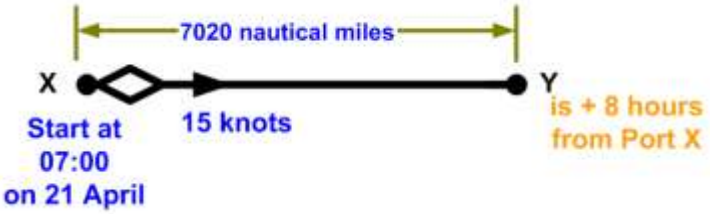
That is: 08:00 on 5 August – 5 hours = 03:00 on 5 August

Example 4 *(from http://maritimesa.org/grade-10/calculating-voyage-duration/)*

Consider Example 2. Now assume that Port Y is in a time zone that is 8 hours ahead the time zone for Port X. What will be the ship's ETA at Port Y.

Solution:

This situation is illustrated in the diagram alongside.



The ship's ETA at Port Y will be 8 hours ahead of the time calculated in Example 2.

That is: 19:00 on 10 May + 8 hours = 05:00 on 10 May

1.6.2 Cost illustration

For our study we consider the following costs for a planned voyage:

- Charter costs,
- Port costs, and
- Fuel costs.

A voyage charter is the hiring of a vessel and crew for a voyage between a load port and a discharge port.

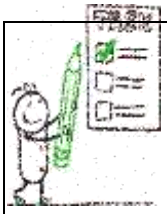
Ports need to cover costs which are incurred in service to a vessel entering, in and leaving the port.

The amount of **fuel** that is used for by a vessel depends primarily on the vessel's speed. Most ship engines are designed for top speeds ranging between 20 knots and 25 knots per hour.

Did you know:

Coal-powered ships are almost entirely heritage. The types of fuel used in modern ships includes mineral oils, bio-fuels, LNG, ethane, methanol and to a lesser extent hydrogen and battery power. Standard types of fuel are marine gas oil (MGO) (also known as distillate fuel) and heavy fuel oil (HFO) (also known residual fuel).

Marine gas oil is presently the highest class of marine fuel and has ***low concentrations of sulphur and particulates***. MGO is expensive compared to the price of HFO. It would be unwise for shipowners to burn the cheaper fuel since the long term effects would incur more costs for human health and environment.



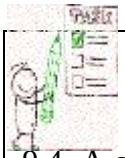
Task 9:

(these tasks are from the test yourself exercises given in section 10.2.4. in http://maritimesa.org/grade-10/calculating-voyage-duration/ as well as additional tasks)

9.1. A ship sails from Port M at 03:00 on 9 March and steams at 22 knots for Port N which is 4224 nautical miles away. If Port N is 6 hours behind Port M, what is the ship's ETA at Port N?

9.2. A ship sails from Port J at 10:00 on 14 January and steams at 12 knots for Port K which is 2592 nautical miles away. If Port K is 6 hours ahead of Port J, what is the ship's ETA at Port K?

9.3. A ship sails from Port P at 13:00 on 4 November and steams at 19 knots for Port Q which is 7296 nautical miles away. If Port P and Port Q are in the same time zone, what is the ship's ETA at Port Q?



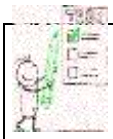
Task 9 continued…

9.4. A ship sails from Port S at 22:00 on 3 September and steams at 16 knots for Port T which is 5952 nautical miles away. What is the ship's ETA at Port T if: Port T is 8 hours behind Port S, and the ship spends a day in the Panama Canal, and the ship crosses the International Date Line from east to west.

9.5. *(adapted from Masuku* [19]*)* Suppose that the only costs for the planned voyage of the *Cape Orchid* from Durban to Shanghai and the times involved are:

Daily charter rate	US$8,000 (excluding fuel)
Estimated time in Durban	5 days
Port costs – Durban	US$5,000 per day
Estimated time in Shanghai	4 days
Ports costs – Shanghai	US$6,000 per day
Distance from Durban to Shanghai	7,200 nautical miles
Operational Speed	15 knots
Fuel Consumption HVF	40 tons per day at sea
Fuel Consumption MDO	3 tons per day at sea and in port
Fuel Prices at Durban HVF	US$132 per ton
Fuel Prices at Durban MDO	US$256 per ton

9.5.1. Calculate the charter costs for the planned voyage.



Task 9 continued…

9.5.2. Calculate the total port costs for the voyage.

9.5.3. The *Cape Orchid* bunkered in Durban. Calculate the fuel costs for the voyage.

9.5.4. Calculate the total cost for the planned voyage from Durban to Shanghai.

9.5.5. Use an exchange rate 13 US$ per South African Rand and calculate the total voyage cost in Rands.

9.5.6. The actual exchange rate on 21 April 2020 was 18.9ZAR/US$. Calculate the total voyage cost using this exchange rate.

9.5.7. Would you have recommended for the *Cape Orchid* to have carried out the planned voyage during the time of the Covid-19 pandemic if the vessel was to transport non-essential cargo? Give reasons for your answer.

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