11. The variables q and t are related such that

$$q = \frac{54}{3^t}$$

(a) Calculate the value of q

(i) when $t = 0$, [1]

(ii) when $t = -2$. [2]

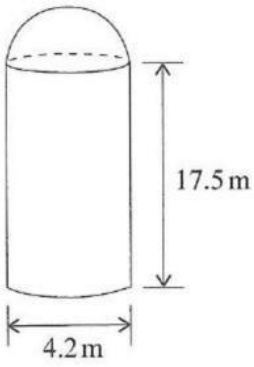
(b) Calculate the value of t when $q = \frac{2}{3}$. [3]

Equation after Cross Multiplying

2( ) = 3( )

x =

11. The diagram shows a silo that consists of a cylinder topped by a hemisphere. The height of the cylinder is 17.5 m and the diameter is 4.2 m.



Using $\pi = \frac{22}{7}$, calculate

(a) the maximum volume of the silo, ignoring the thickness of the material used to make the silo, [5]

Volume of Cylinder =

Volume of Hemi Sphere =

Maximum Volume =

(b) the total surface area of the silo. [5]

Surface Area of Cylinder =

Surface of Hemi Sphere =

A small scale model of the silo is made on a scale of 1:20

(c) Calculate the total surface area of the model. [2]

Area Scale =

Surface Area of Scale Model =

11. (a) Solve the inequalities

(i) $5x + 7 \leq 17$ [2]

(ii) $6 - \frac{x}{2} < 7$ [3]

(b) Write down the set of integers that satisfies both inequalities in (a). [1]

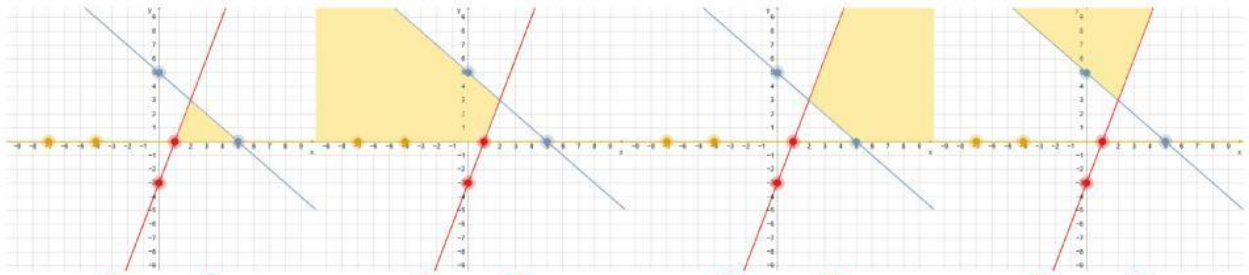
(c) Using a scale of 1 cm for 1 unit on each axis for $-4 \leq x \leq 6$ and $-4 \leq y \leq 6$, draw the graphs of

(i) $y = 5 - x$ [2]

(ii) $y = 3x - 3$ [2]

(d) From the graphs of (c), shade the region that satisfies the following system of inequalities.

$$\begin{cases} y \leq 5 - x \\ y \leq 3x - 3 \\ y \geq 0 \end{cases}$$ [2]



Option A Option B Option C Option D

11. (a) The function is defined as $f: x \rightarrow ax + b$.

(i) Find the values of a and b given that $f(1) = 11$ and $f(2) = 9$. [4]

f(1) = = 11

f(2) = = 9

a = b =

(ii) Hence or otherwise find the value of x if $f(x) = -1$. [2]

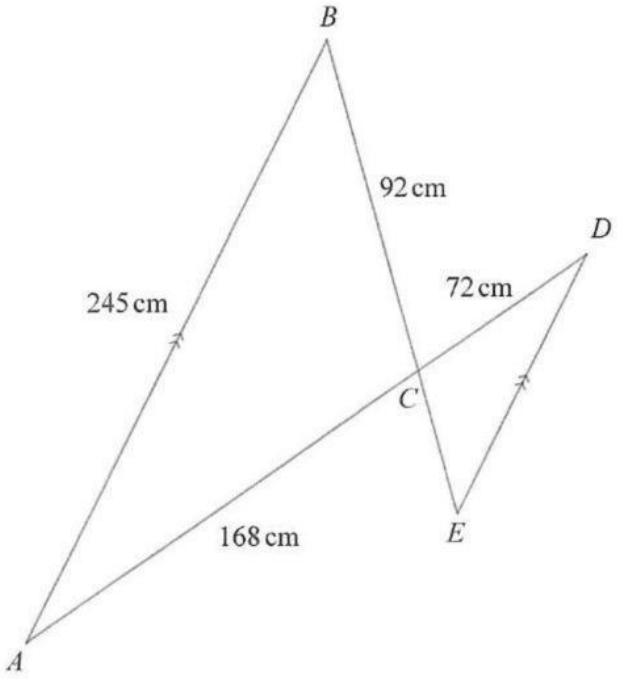
f(x) = = -1

x =

(b) The function h is such that $h(x) = \frac{2x - 3}{x}$. Calculate $h^{-1}(x)$. [4]

Inverse function of h = ————

11.



NOT TO SCALE

AB is parallel to ED, $AB = 245$ cm, $AC = 168$ cm, $BC = 92$ cm, and $CD = 72$ cm.

(a) Find the size of angle ACB. [4]

Cos A = ————

A =

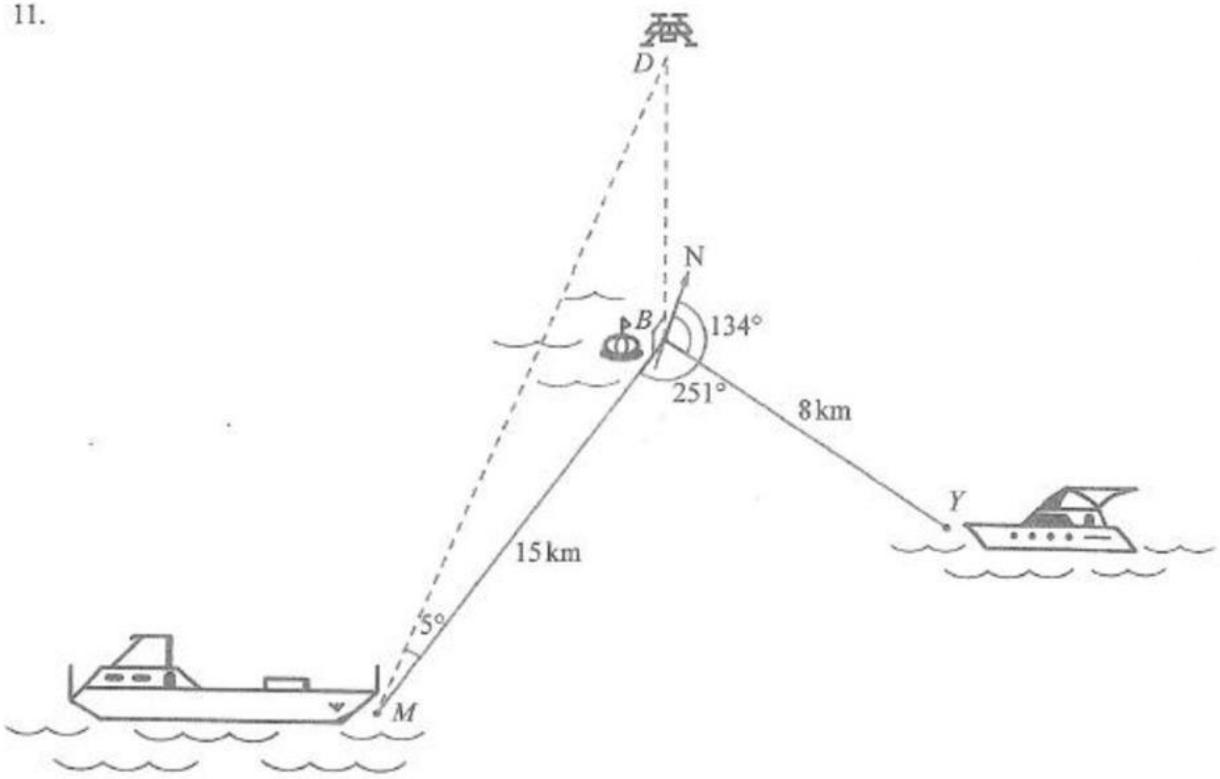
(b) Find the area of triangle ABC. [2]

Area =

(c) State, in the correct order, the triangle that is similar to triangle ABC. [1]

(d) Hence or otherwise, find length DE. [2]

11.



The diagram shows the relative positions of a yacht (Y), mailboat (M), buoy (B) and a flying drone (D).

The yacht is 8 km from the buoy on a bearing of 134°.

The mailboat is 15 km from the buoy on a bearing of 251°.

(a) Calculate $M\hat{B}Y$. [1]

(b) Find the distance MY between the mailboat and the yacht, correct to the nearest km. [4]

$MY^2 =$

(c) Calculate $M\hat{Y}B$, correct to the nearest degree. [4]

Formula after substituting

$\frac{15}{\quad} = \frac{\quad}{\quad}$

Angle MYB =

(d) Find the bearing of the mailboat from the yacht. [2]

A drone (D) hovers directly above the buoy.

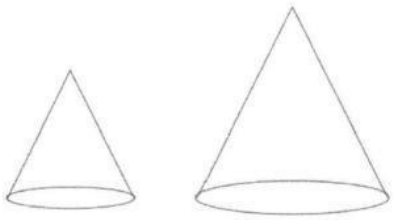
The angle of elevation from the mailboat to the drone is 5°.

(e) Find the hovering height of the drone above the buoy. [2]

Trig Ratio Needed =

Trig Formulae

11.



Height 6 cm Height 9 cm

Two similar cones are shown.

The surface area of the larger cone is 54 cm^2.

(a) Find the surface area of the smaller cone. [2]

Area Scale =

Surface Area of Smaller Cone =

The volume of the smaller cone is 24 cm^3.

(b) Find the volume of the larger cone. [2]

Volume Scale =

Volume of Larger Cone =