1 Astrid wants to buy some oil.
She can buy the oil from either Dane Oil or Arctic Oil.

Here is information about the price that each company will charge Astrid.

Dane Oil	Arctic Oil
(4.2×10^5) litres for 2 500 000 Krone	(8.6×10^5) litres for 770 000 Dollars

Astrid wants to get the better value for money for the oil.

1 Dollar = 6.57 Krone

From which company should she buy her oil, Dane Oil or Arctic Oil?
You must show your working.

Finding litre per amount of money :

Dane Oil : $\frac{4.2 \times 10^5 \text{ litre}}{2500000 \text{ K}} = 0.168 \text{ litre/K}$ (1)

Arctic Oil : $\frac{8.6 \times 10^5 \text{ litre}}{770000 \text{ D}} = 1.12 \text{ litre/D}$ (1)

$= \frac{1.12 \text{ litre}}{1 \text{ Dollar}} \times \frac{1 \text{ Dollar}}{6.57 \text{ K}}$ – convert to Krone

$= 0.169 \text{ litre/K}$ (1)

∴ Arctic oil gives better value for money. (1)

(Total for Question 1 is 4 marks)

2 M varies directly as the cube of h
$M = 4$ when $h = 0.5$

Find the value of h when $M = 500$

$M \propto h^3$

$M = kh^3$ (1)

$4 = k(0.5)^3$

$k = \frac{4}{0.5^3} = 32$ (1)

$500 = 32h^3$

$h^3 = \frac{500}{32} = 15.625$ (1)

$h = \sqrt[3]{15.625}$

$= 2.5$ (1)

2.5

(Total for Question 2 is 4 marks)

3 y is inversely proportional to $\sqrt{x}$
x is directly proportional to T^3

Given that $y = 8$ when $T = 25$

find the exact value of T when $y = 27$

$y = \frac{k}{\sqrt{x}}$, $x = pT^3$

$y = \frac{k}{\sqrt{pT^3}}$

let $\frac{k}{\sqrt{p}} = c$,

$y = \frac{c}{\sqrt{T^3}}$ (1)

$8 = \frac{c}{\sqrt{25^3}}$

$c = 8 \times \sqrt{25^3}$

$= 1000$ (1)

$27 = \frac{1000}{\sqrt{T^3}}$ (1)

$T^3 = \frac{1000^2}{27^2}$ $T = \left(\frac{1000^2}{27^2}\right)^{\frac{1}{3}} = \frac{100}{9}$ (1)

$T =$ $\frac{100}{9}$

(Total for Question 3 is 4 marks)

4 A is inversely proportional to C^2

$A = 40$ when $C = 1.5$

Calculate the value of C when $A = 1000$

$$A = \frac{k}{C^2}$$

$$40 = \frac{k}{1.5^2}$$

$$k = 40 \times 1.5^2$$

$$k = 90 \quad (1)$$

$$1000 = \frac{90}{C^2}$$

$$C^2 = \frac{90}{1000}$$

$$C = \sqrt{\frac{9}{100}} = \frac{3}{10} = 0.3 \quad (1)$$

(1)

$C =$ 0.3

(Total for Question 4 is 3 marks)

5 F is inversely proportional to the square of r

$F = 36$ when $r = 4$

(a) Find a formula for F in terms of r

$F = \frac{k}{r^2}$ (1)

$36 = \frac{k}{4^2}$ (1)

$k = 36 \times 16$

$= 576$

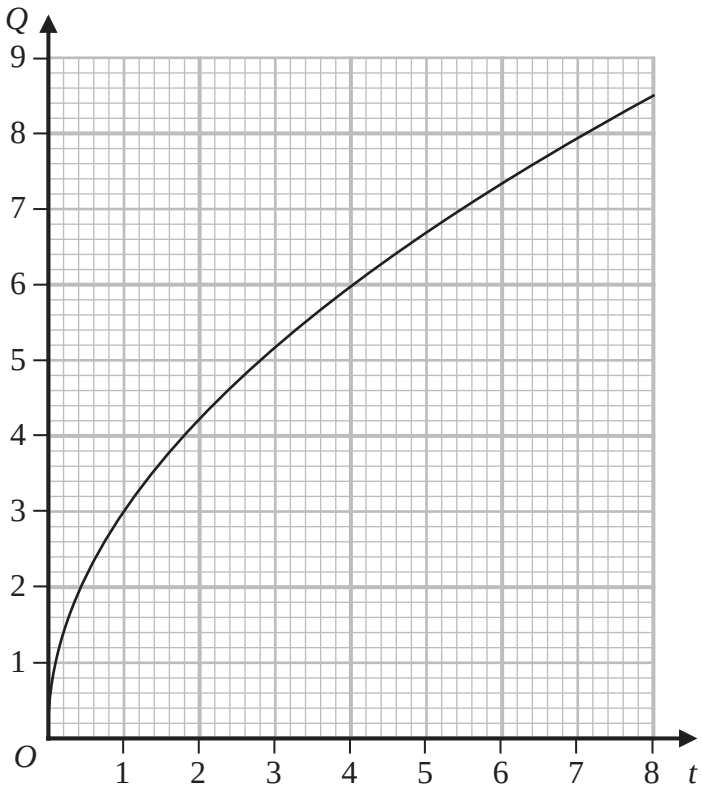
$F = \frac{576}{r^2}$ (1)

.....

(3)

(Total for Question 5 is 3 marks)

6 Q is directly proportional to $\sqrt{t}$
The graph shows the relationship between Q and t for $0 < t < 8$



(a) Find a formula for Q in terms of t

$Q = k\sqrt{t}$ (1)

At point $(1, 3)$: $3 = k\sqrt{1}$

$k = 3$ (1)

$Q = 3\sqrt{t}$ (1)

$Q = 3\sqrt{t}$

(3)

(Total for Question 6 is 3 marks)