For Examiner's Use

7 A particle moves in a straight line so that, t s after passing through a fixed point O, its velocity, v ms^{-1}, is given by $v = \dfrac{60}{(3t + 4)^2}$.

(i) Find the velocity of the particle as it passes through O. [1]

(ii) Find the acceleration of the particle when $t = 2$. [3]

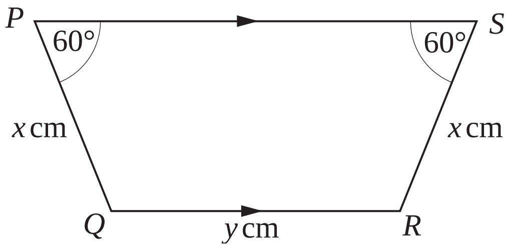
(iii) Find an expression for the displacement of the particle from O, t s after it has passed through O. [4]

11 Answer only **one** of the following two alternatives.

EITHER

(a) Using an equilateral triangle of side 2 units, find the exact value of sin 60° and of cos 60°. [3]

(b)



PQRS is a trapezium in which $PQ = RS = x$ cm and $QR = y$ cm.
Angle *QPS* = angle *RSP* = 60° and *QR* is parallel to *PS*.

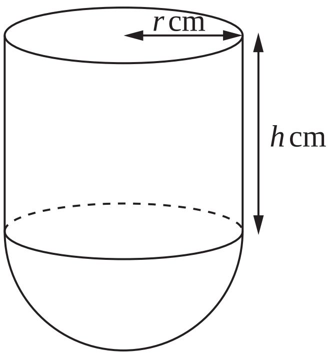
(i) Given that the perimeter of the trapezium is 60 cm, express y in terms of x. [2]

(ii) Given that the area of the trapezium is A cm^2, show that

$$A = \frac{\sqrt{3}(30x - x^2)}{2}.$$ [3]

(iii) Given that x can vary, find the value of x for which A has a stationary value and determine the nature of this stationary value. [4]

OR



For a sphere of radius r:

Volume = $\frac{4}{3}\pi r^3$

Surface area = $4\pi r^2$

The diagram shows a solid object in the form of a cylinder of height h cm and radius r cm on top of a hemisphere of radius r cm. Given that the volume of the object is 2880π cm^3,

(i) express h in terms of r, [2]

(ii) show that the external surface area, A cm^2, of the object is given by

$$A = \frac{5}{3}\pi r^2 + \frac{5760\pi}{r}.$$ [3]

Given that r can vary,

(iii) find the value of r for which A has a stationary value, [4]

(iv) find this stationary value of A, leaving your answer in terms of π, [2]

(v) determine the nature of this stationary value. [1]