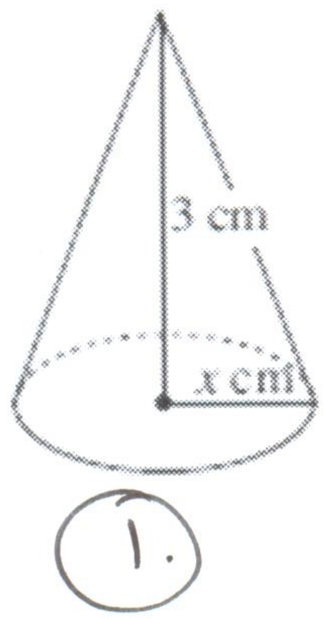
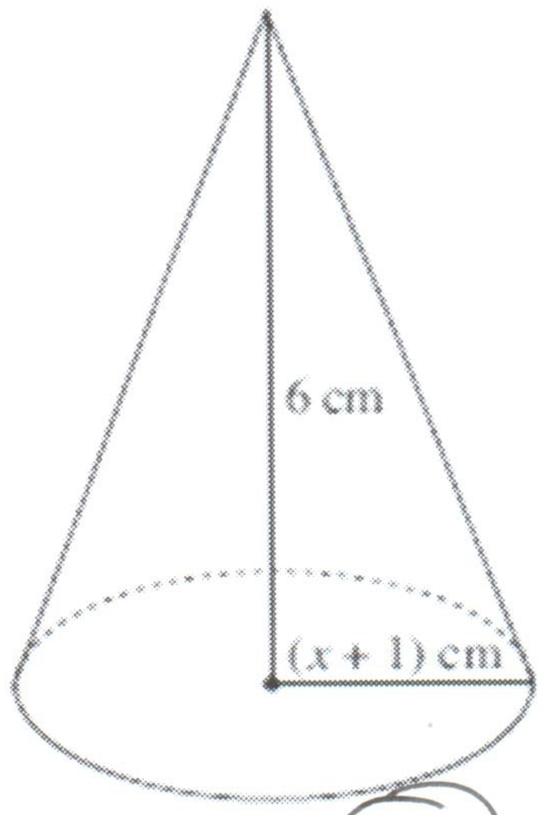
ANSWERS.

Quadratic Equations - Factorising

16. Two cones are shown in the diagram below. The radius of the smaller cone is x cm and the height is 3 cm. The radius of the larger cone is $(x + 1)$ cm and the height is 6 cm.



1.



2.

Diagrams not drawn to scale.

(a) The total volume of the two cones together is 102π. Show that $3x^2 + 4x - 100 = 0$.

$V = \frac{1}{3}\pi r^2 h$

(1) $= \frac{1}{3} \cdot \pi \cdot x^2 \cdot 3$

$= \pi x^2$ (1)

(2) $= \frac{1}{3} \cdot \pi \cdot (x+1)^2 \cdot 6$

$= 2\pi(x^2 + 2x + 1)$

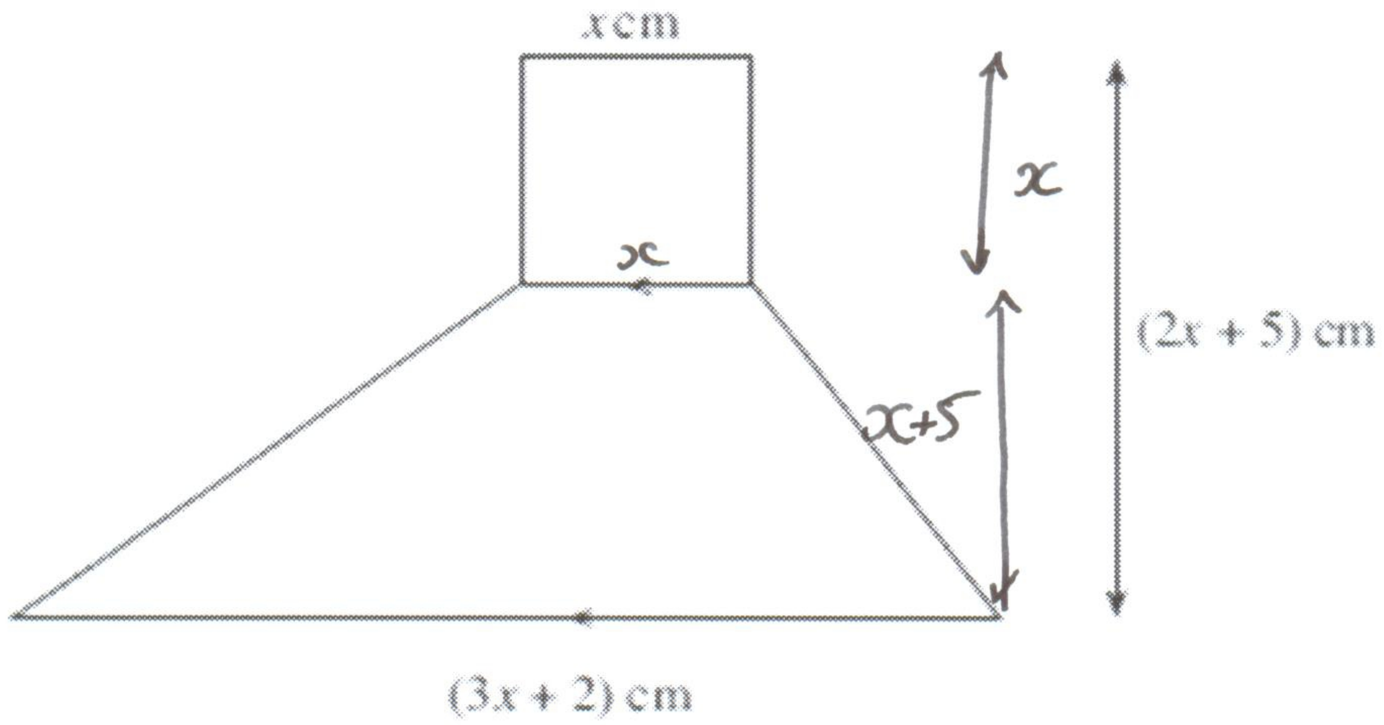
$= \pi(2x^2 + 4x + 2)$ (1)

So total Volume $\Rightarrow$ $\pi x^2 + \pi(2x^2 + 4x + 2) = 102\pi$ (1)

$x^2 + 2x^2 + 4x + 2 = 102$

$3x^2 + 4x - 100 = 0$ As required. (1) [4]

15. A composite shape is made by joining a square and a trapezium as shown. The dimensions are shown on the diagram.



(a) Show that the area of the trapezium is $(2x^2 + 11x + 5)\ cm^2$.

$A = \frac{1}{2}(a+b)h = \frac{1}{2}(x + 3x+2)(x+5)$ (1)

$= \frac{1}{2}(4x+2)(x+5)$

$= \frac{1}{2}(4x^2+20x+2x+10)$

$= \frac{1}{2}(4x^2+22x+10)$ (1)

$= 2x^2+11x+5$ (1)

[3]

16. For the first x seconds of a journey the average speed of a cyclist is 3 m/s. For the next $(3x + 2)$ seconds the average speed is $7x$ m/s. The total distance travelled is 250 metres.

(a) Show that x satisfies the equation $21x^2 + 17x - 250 = 0$.

Distance = speed x time.

1st section = $3x$ (1)

2nd section = $(3x+2).7x = 21x^2 + 14x$ (1)

∴ Total dist $\Rightarrow 250 = 3x + 21x^2 + 14x$

$250 = 21x^2 + 17x$

$0 = 21x^2 + 17x - 250$ (1)

[3]

13. A solid cuboid has length $(x + 5)$cm, width $(x + 4)$cm and height 6 cm.
The surface area of the cuboid is 205 cm^2.

(a) Show that x satisfies the equation $2x^2 + 42x - 57 = 0$.

Top / Bottom ⇒ $2 \times (x+5)(x+4)$

$2 \times (x^2 + 9x + 20)$

$2x^2 + 18x + 40$ (1)

Sides ⇒ $2 \times (6 \times (x+4))$

$12x + 48$

Front / Back ⇒ $2 \times (6 \times (x+5))$

$12x + 60$ (1)

Total ⇒ $2x^2 + 18x + 40 + 12x + 48 + 12x + 60 = 205$

$2x^2 + 42x + 148 = 205$

$2x^2 + 42x - 57 = 0$ (1)

[3]