Integer Substitution with Powers and Roots: Exercise

1 Given that $z = 6$, work out the following:

a z^2

b $\dfrac{z^2}{3}$

c $-z^2$

d $30 - z^2$

e $2z^2$

f $4\sqrt{z}$

g $\sqrt[3]{3z}$

h $\sqrt{2z - 2}$

i $\sqrt[3]{z^3}$

j $\sqrt[5]{-3z^2}$

2 Work out the value of....

a $y^2 + 11$ when $y = -2$

b $3a^2 + 3$ when $a = 7$

c $(2m + 5)^2$ when $m = -10$

d $\sqrt[3]{2p}$ when $p = -32$

e $2\sqrt{3g - 4h}$ when $g = 3, h = -4$

f $\sqrt{4y} - \sqrt[5]{-2x}$ when $x = 16, y = 4$

3 What value of x would make the following equations equal 0? Choose from one of the four options available for each question.

a $\sqrt{2x - 4}$ A: $x = 1$ B: $x = -1$ C: $x = 2$ D: $x = -2$

b $2\sqrt{x} - 16$ A: $x = 4$ B: $x = -4$ C: $x = 64$ D: $x = -64$

c $x^2 + x - 6$ A: $x = 1$ B: $x = 2$ C: $x = 3$ D: $x = 4$

d $x^2 + 9x + 20$ A: $x = -1$ B: $x = -2$ C: $x = -3$ D: $x = -4$

e $49 - x^2$ A: $x = 7$ B: $x = 49$ C: $x = 0$ D: Impossible

f   Questions c – e have another solution that make the equation equal to 0. Find the other solution for each question.

4 The stopping distance, d, of a car can be found using the formula $d = \frac{mv^2}{2f}$

where m is the mass of the car in kilogram (kg),
v is the speed of the car in metres per second (m/s),
f is the braking force in Newtons (N), and
d is the distance in metres (m).

a A car has mass 850 kg and moves at a speed of 10 m/s.
If the car has a braking force of 2500 N, what will the braking distance of the car be?

b A car has mass 1000 kg and moves at a speed of 30 m/s.
What would the braking force need to be for the braking distance to be 450 m?

☠ The deforestation of a rainforest can be modelled by looking at historical data.

MetLink
Royal Meteorological Society

Below a formula has been created for the surface area of a rainforest, S, in km^2 t years after 2020.
$$S = 200{,}000 \times 0.95^t$$

a What was the surface area of the rainforest in 2020?

b What was the surface area of the rainforest in 2023?

We can calculate the rate of deforestation in the next 10 years from 2023 using the following formula:
$$r = 1 - \sqrt[10]{\frac{S}{171475}}$$

c What is the rate of deforestation if the surface area, S, is $150{,}000$ km^2, 10 years after 2023?