U2D4_T Modelling with Algebraic Expressions

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U2D4_T Modelling...

U2D4 MPM1DI

Substitution and Modelling with Algebraic Expressions

Substitution:

Example 1: Solve the following equations involving exponents.

a) The volume of a sphere is given by the formula $V = \frac{4}{3}\pi r^3$

Calculate the volume when r = 3 cm.

$V = \frac{4}{3}\pi(3)^3$

$= \frac{4\pi(3)^3}{3^1}$

$= 4\pi(3)^{3-1}$

$= 4\pi(3)^2$

$= 4\pi(9)$

$= 36\pi \text{ cm}^3$ OR about 113 cm^3

Substitution and Modelling with Algebraic Expressions

b) Given the equation

$h = (t-5)^3 - t^2 + 3(t-1) - 2$

solve for h when:

i) t = 3

$h = (3-5)^3 - (3)^2 + 3(3-1) - 2$

$h = (-2)^3 - 9 + 3(2) - 2$

$h = -8 - 9 + 6 - 2$

$h = -19 + 6$

$\boxed{h = -13}$

ii) t = 5.5

$= 5\frac{1}{2}$

$= \frac{11}{2}$

$h = \left(\frac{11}{2} - 5\right)^3 - \left(\frac{11}{2}\right)^2 + 3\left(\frac{11}{2} - 1\right) - 2$

$h = \left(\frac{1}{2}\right)^3 - \frac{11^2}{2^2} + \frac{3}{1}\left(\frac{9}{2}\right) - \frac{2}{1}$

$h = \frac{1}{8} - \frac{121}{4} + \frac{27}{2} - \frac{16}{8}$ LCD 8

$h = \frac{1}{8} - \frac{242}{8} + \frac{108}{8} - \frac{16}{8} = \frac{-258+109}{8} = \frac{-149}{8}$

Substitution and Modelling with Algebraic Expressions

Modelling with Algebraic Expressions

Example 2

Peanuts sell at $5/kg and almonds sell at $20/kg.

a) Write an expression that would represent the cost of a mixture of peanuts and almonds.
Remember your 'let' statements; include units!

Let p represent the mass of peanuts in kg.

Let a represent the number of kg of almonds.

$5p + 20a$ is the total cost ($).

b) What would the cost of the mixture be if there is 1 kg of peanuts and 0.4 kg of almonds.

$5(1) + 20(0.4)$

$= 5 + 8$

$= 13$

$\therefore$ it would cost $13 for the mixture.

20×0.4 (÷10, ×10)
$= 2 \times 4$

Substitution and Modelling with Algebraic Expressions

Example 3

The Kitchener Auditorium charges $30 for blue seats, $20 for gold seats and $10 for red seats.

a) Write an expression that describes the total earnings from seat sales. **remember your 'let' statements**

Let b, g, and r represent the number of blue, gold, and red seats.

$30b + 20g + 10r$ is the total earnings.

b) How much will the arena earn if it sells 60 blue seats, 250 gold seats and 325 red seats?

$30(60) + 20(250) + 10(325)$

$= 1800 + 5000 + 3250$

$= 10\,050$

∴ the arena will earn $10 050.