

Modelling with Algebra

J. Garvin



Slide 1/11

Rearranging Formulae

Recap

An amusement park charges a \$12 admission fee, and \$3 per ride. An equation to model the total cost, C dollars, after riding on r rides is $C = 3r + 12$. On how many rides can a person go if s/he has \$75?

To determine the number of rides, isolate r .

$$\begin{aligned} C &= 3r + 12 \\ C - 12 &= 3r \\ \frac{C - 12}{3} &= r \end{aligned}$$

J. Garvin — Modelling with Algebra
Slide 2/11

Rearranging Formulae

Substitute $C = 75$ into the new equation.

$$\begin{aligned} r &= \frac{75 - 12}{3} \\ &= 21 \end{aligned}$$

Therefore, the person can go on 21 rides.

J. Garvin — Modelling with Algebra
Slide 3/11

Modelling with Algebra

Sometimes an equation will not be given, and you will need to create one to model a particular situation.

These situations may draw from a wide area of previously-covered topics.

In these cases, it is useful to list all known quantities (constants) and unknown quantities (variables).

Remember to define your variables (use “let” statements) and conclude your solutions with an appropriate statement.

J. Garvin — Modelling with Algebra
Slide 4/11

Modelling with Algebra

Example

Jim, Marguerite and Naomi agree to paint a house for \$2100. Marguerite works twice as long as Jim, but only half as long as Naomi. How should the three split the money, based on the amount of work each did?

Since the amount of work Jim did is unknown, represent this amount as j .

Marguerite did twice as much work as Jim, or $2j$.

Naomi did twice as much work as Marguerite, or $2(2j) = 4j$.

Use these values to construct an algebraic model for the problem.

J. Garvin — Modelling with Algebra
Slide 5/11

Modelling with Algebra

Together, they earn \$2100, so $j + 2j + 4j = 2100$. Collect like terms and solve for j .

$$\begin{aligned} j + 2j + 4j &= 2100 \\ 7j &= 2100 \\ \frac{7j}{7} &= \frac{2100}{7} \\ j &= 300 \end{aligned}$$

Therefore, Jim earns \$300, Marguerite earns $2 \times 300 = \$600$, and Naomi earns $4 \times 300 = \$1200$.

J. Garvin — Modelling with Algebra
Slide 6/11

Modelling with Algebra

Example

In three years, Maria will be twice as old as Arjun. The sum of their ages, right now, is 24. How old are they now?

These problems can be confusing if knowns and unknowns are not carefully recorded.

Let a represent Arjun's age right now. In three years he will be $a + 3$ years old.

Since the sum of the two ages is 24, Maria must be $24 - a$ years old right now.

Therefore, in three years Maria will be $24 - a + 3 = 27 - a$ years old.

In three years, Maria is twice as old as Arjun is then, so $27 - a = 2(a + 3)$.

J. Garvin — Modelling with Algebra
Slide 7/11

Modelling with Algebra

Use the distributive property to expand, then collect like terms to solve.

$$27 - a = 2(a + 3)$$

$$27 - a = 2a + 6$$

$$27 - 6 = 2a + a$$

$$21 = 3a$$

$$a = 7$$

Therefore, Arjun is 7 years old right now. Since the sum of their ages is 24, Maria is $24 - 7 = 17$ years old right now.

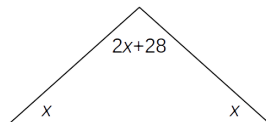
J. Garvin — Modelling with Algebra
Slide 8/11

Modelling with Algebra

Example

In an isosceles triangle, the angle opposite the base is 28° greater than twice the other angles. What are the measures of the angles?

A diagram of the situation is below.



J. Garvin — Modelling with Algebra
Slide 9/11

Modelling with Algebra

Since the sum of the angles in any triangle is 180° , we can use the equation $x + x + (2x + 28) = 180$ to determine the measures of the angles.

$$x + x + (2x + 28) = 180$$

$$4x + 28 = 180$$

$$4x = 180 - 28$$

$$4x = 152$$

$$\frac{4x}{4} = \frac{152}{4}$$

$$x = 38$$

Therefore, the smaller angle is 38° , while the larger angle is $2(38) + 28 = 104^\circ$.

J. Garvin — Modelling with Algebra
Slide 10/11

Questions?



J. Garvin — Modelling with Algebra
Slide 11/11