

Algebra Excellence Practice.

1. Two numbers have a sum of 34 and a difference of 8.

What are the two numbers?

Let numbers be x and y

$$x + y = 34$$

$$x - y = 8$$

$$\text{adding: } 2x = 42 \qquad x = 21 \text{ and } y = 13$$

2. Two railway bridges have a total length of 435m. One bridge is 78M longer than the other. Calculate the length of the shorter bridge.

$$x + y = 435$$

$$x - y = 78$$

$$\text{adding } 2x = 513$$

$$x = 256.5 \text{ and shorter one is } 178.5$$

3. A cell phone company charges a connection fee each month and users also pay for the total time that have used. This is charged by the minute.

In August a user paid \$16 for a total of 6 minutes use.

In September the same user paid \$29 for a total of 32 minutes use.

Find out the monthly connection fee and charge per minute.

Let charge be $C = at + b$ where $t = \text{time}$, a and b are constants.

$$16 = 6a + b$$

$$29 = 32a + b$$

Subtracting $13 = 26a$ so $a = \$\frac{1}{2}$ (ie 50c per min)

Sub in 1st equ $16 = 3 + b$ so $b = \$13$ connection fee

4. Kevin buys seven tickets to the Rugby World Cup for two adults and five children. The total cost of the tickets is \$140. A child's ticket costs \$7 less than an adult's ticket. Calculate the cost of an adult's ticket.

$a = \text{number of adult tickets}$, $c = \text{number of child tickets}$

$$2a + 5c = 140$$

$$c = a - 7$$

$$\text{subs } 2a + 5(a - 7) = 140$$

$$7a - 35 = 140$$

$$7a = 175$$

$$a = \$25 \quad c = \$18$$

5. The sides of a rectangle are $(x+1)$ and $(x+9)$ metres. If the area is 20m^2 , calculate the lengths of the sides.

$$A = bh \quad \text{so } 20 = (x + 1)(x + 9)$$

$$20 = x^2 + 10x + 9$$

$$0 = x^2 + 10x - 11$$

$$0 = (x + 11)(x - 1)$$

$$x = 1 \text{ but cannot be } -11 \text{ Sides are } 2 \text{ and } 10$$

6. A woman is 22 years older than her daughter. Their ages multiply to 135. Calculate the mother's age.

Let daughter be d years. Mother is $d + 22$

$$d(d + 22) = 135$$

$$d^2 + 22d - 135 = 0$$

$$(d + 5)(d - 21) = 0$$

$$d = 21 \text{ years } (-5 \text{ not valid})$$

mother is 43 years

7. Three more than a number is added to the square of the same number and the total is 9. Find the two possible numbers.

$$(x + 3) + x^2 = 9$$

$$x^2 + x - 6 = 0$$

$$(x - 2)(x + 3) = 0$$

$$x = 2 \text{ or } -3$$

8. Two consecutive numbers multiply to give 156. Find the numbers.

$$x(x + 1) = 156$$

$$x^2 + x - 156 = 0$$

$$(x - 12)(x + 13) = 0$$

$$x = 12 \text{ or } -13$$

The two numbers could be 12 and 13 or -13 and -12

9. Two consecutive even whole numbers have a product of 168. What are the two numbers?

$$x(x + 2) = 168$$

$$x^2 + 2x - 168 = 0$$

$$(x - 12)(x + 14) = 0$$

The two numbers could be 12 and 14 or -14 and -12

10. Two consecutive multiples of 3 have a product of 378. Find the numbers.

$$x(x + 3) = 378$$

$$x^2 + 3x - 378 = 0$$

$$(x - 18)(x + 21) = 0$$

The two numbers could be 18 and 21 or -21 and -18

11. Find the two positive and negative numbers whose difference is 7 and whose product is 228.

$$x(x + 7) = 228$$

$$x^2 + 7x - 228 = 0$$

$$(x - 12)(x + 19) = 0$$

The two numbers could be 12 and 19 or -19 and -12