

Harder Writing Equations Practice #2

The solutions for some of these require the ability to solve quadratics and simultaneous equations, which are Year 11 skills.

*There is **no** point using "guess and check" or working backwards using only numerical techniques. Marks are not awarded for the answers, only correct techniques.*

Write equations and solve using algebraic methods. The solution is given for the first three, to help focus on the method, not just the answer.

1. What two numbers add to give 3 but subtract to give 13?
(answer = 8 and -5)
2. Three numbers average to get 141. If the largest is 50 more than the smaller, and the middle one is 31 more than the smaller, how large is the biggest number? (answer = 164)
3. Two pencils and three erasers cost \$3.05. One pencil and one eraser cost \$1.10. What does a pencil cost? (answer = pencil costs \$0.25)
4. Find the number that when squared is 2970 more than the starting number.
5. Find the right angle triangle that is three times as high as it is wide and which has an area of 294 cm^2 .
6. Find numbers A and B, which when multiplied together give 484, and when one is divided by the other give 0.25.

Answers: Harder Writing Equations Practice #2

The equations we are looking for are shown in bold. Other forms are acceptable, and obviously the letters chosen for the unknown(s) do not matter.

1. Call them x and y . We are told that $x + y = 3$ and that $x - y = 13$

$$x = 13 + y \quad \text{Put that into the first equation, gives } 13 + y + y = 3$$

$$y = 8 \quad x + y = 3 \quad \text{The numbers are } -5 \text{ and } 8.$$

2. Call the smaller one x . We are given that others are $x + 31$ and $x + 50$

$$\text{Average means that: } \frac{x + (x + 31) + (x + 50)}{3} = 141 \quad : \quad \frac{3x + 81}{3} = 141$$

$$3x + 81 = 141 \times 3 \quad 3x = 423 - 81 \quad x = 342 \div 3$$

$$\text{The smaller number is } 114 \quad \text{The largest number is } 164$$

3. ① $2p + 3e = 3.05$ and ② $p + e = 1.1$

$$\text{Taking equation ② and doubling it gives us } 2p + 2e = 2.2$$

$$\text{Taking the new ② from ① gives us that } e = 3.05 - 2.2 = 0.85$$

$$p + e = 1.1 \text{ and since } e = 0.85, p = 0.25 \quad \text{A pencil costs } \$0.25$$

4. Call the number x . We are told that $x^2 - x = 2970$ (or $x^2 = x + 2970$)

$$x^2 - x - 2970 = 0 \quad (x - 55)(x + 54) = 0 \quad x = 55 \text{ or } -54$$

The numbers are 55 and -54 (Need both for full marks)

5. Base, x , is tripled to give height = $3x$

$$\text{Area of triangle} = \frac{1}{2}bh, \text{ so the equation we need to solve is: } \frac{1}{2} \times x \times 3x = 294$$

$$1.5x^2 = 294 \quad x^2 = 294 \div 1.5 \quad x = \sqrt{196} = 14$$

The base is 14 cm and the height is 42 cm

6. $A \times B = 484$ and $\frac{A}{B} = 0.25$

The second can also be written as $A = 0.25B$, which we can put into the first

$$0.25B \times B = 484 \quad 0.25 B^2 = 484 \quad B^2 = 484 \div 0.25$$

$$B = \pm\sqrt{1936} = \pm 44 \quad A = 0.25B = 0.25 \times \pm 44 \quad \text{A is } 14 \text{ and B is } 11 \text{ or } -14, -11$$