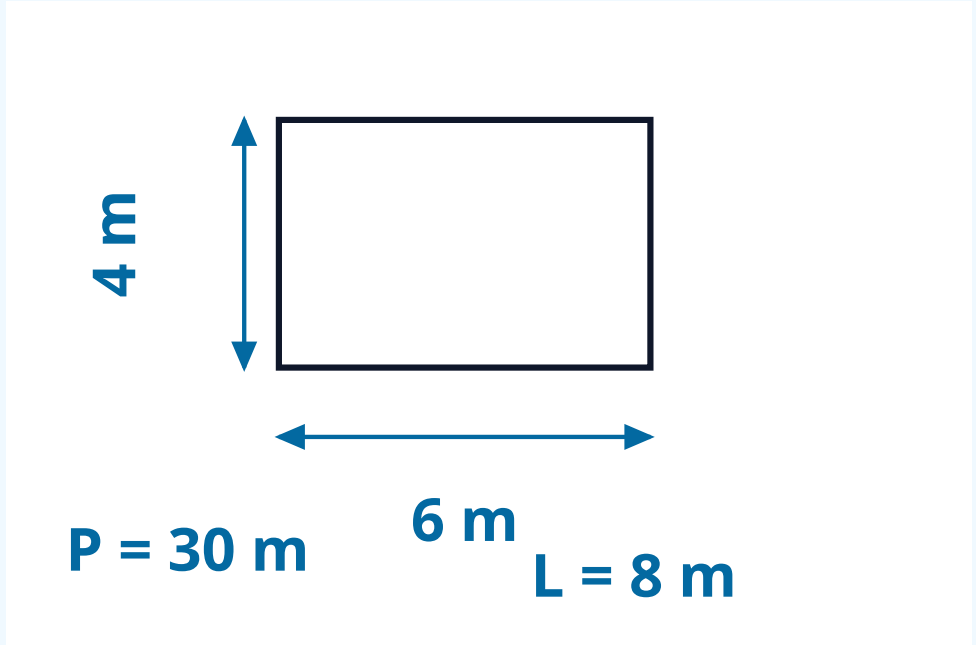
Mathematics 10-3

Unit A: Algebra and working with formulas

Workplace formulas

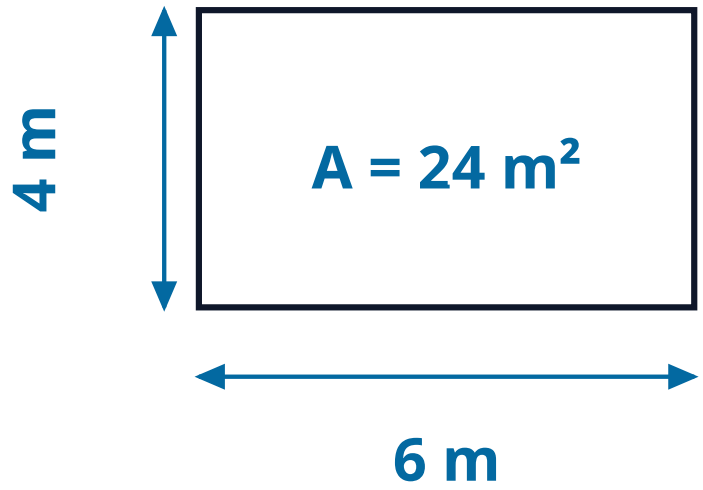
Coating area and rail length

- A painter has a panel 6 metres by 4 metres and wants the area before ordering coating.
- A fence crew has a perimeter of 30 metres and a length of 8 metres, and the width is the measure still wanted.



Substitution and isolating a variable

- Substitution replaces each letter in a formula with a known measure and then follows the operations.
- On a panel, A means area, l means length, and w means width.
- A = l times w = 6 times 4 = 24 square metres.
- A rearrangement isolates the letter a worker needs.
- W = P/2 - L is the rearrangement of P = 2(L + W).
- Equivalent forms name one relationship.
- A = l w and w = A/l agree because 24 divided by 6 equals 4 and 6 times 4 equals 24.
- The radius is half a diameter.



Key terms

formula

A formula is a rule that links workplace measures through letters and operations. (A = l w)

substitution

Substitution is the replacement of each letter by a known measure, followed by the operations written in the formula. (A = 6 × 4)

rearrangement

A rearrangement is a form of a formula in which the letter a worker needs stands alone. (W = P/2 - L)

equivalent forms

Equivalent forms are two writings of one relationship, confirmed when the same measures satisfy both writings. (A = l w and w = A/l)

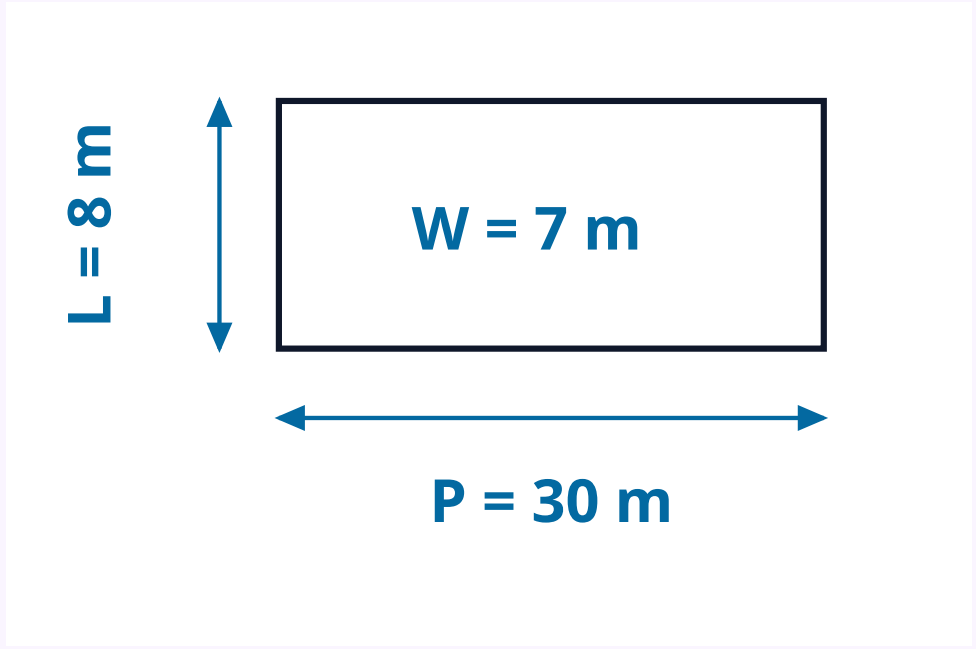
Key terms

radius

The radius is half a diameter, and it is the length taken by the letter r in a circle area formula. (r = d/2)

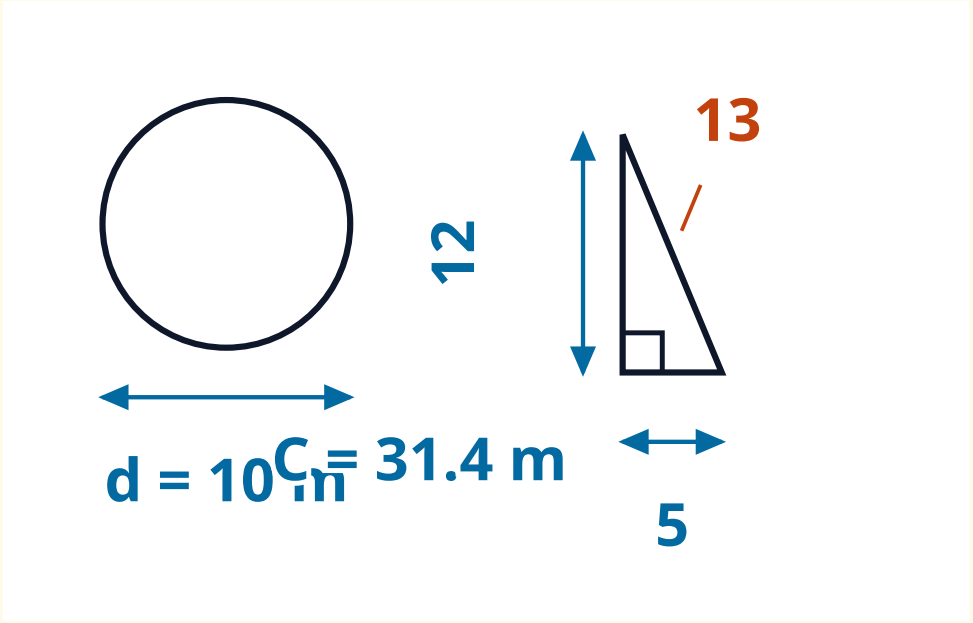
Area and width from formulas

- Direct substitution in A = l times w uses a length of 6 metres and a width of 4 metres.
- Six times 4 equals an area of 24 square metres.
- The equivalent form w = A/l returns 24 divided by 6 equals 4, and substituting those edges back gives 6 times 4 equals 24.
- With P = 30 metres and L = 8 metres, P/2 equals 15.
- W = 15 minus 8 = 7 metres, from the form W = P/2 - L.



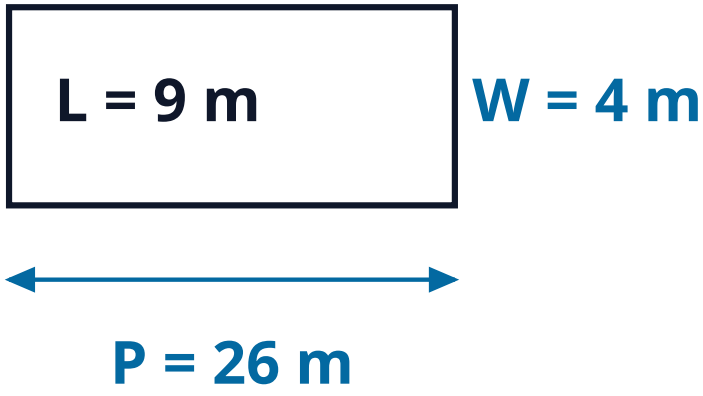
Formulas in trades

- The rim formula is $C = \pi d$, with $C = 31.4$ metres and $\pi = 3.14$.
- Divide 31.4 by 3.14.
- Because 3.14 times 10 equals 31.4, the diameter is 10 metres.
- The brace has hypotenuse 13 metres and one leg of 5 metres.
- Square 13 to get 169, and square 5 to get 25.
- Subtract 169 minus 25 to get 144.
- The square root of 144 is 12, so the other leg is 12 metres.
- The pay envelope is 720 dollars for 36 hours.
- Divide 720 by 36 to get 20 dollars per hour.



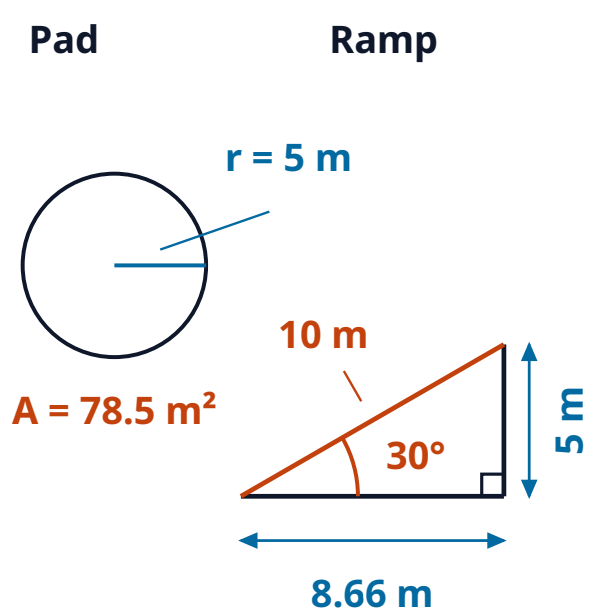
A fence question

- The comparison fence has a perimeter budget of 26 metres and one side already set at 9 metres.
- Half of 26 is 13, and 13 minus 9 is 4, so the adjacent side is 4 metres from W = P/2 - L.
- Your own question needs a new perimeter, a new known side, and the same two operations.



Formula errors in trades

- On a ramp, opposite = hypotenuse × sin(angle).
- A ramp of 10 metres at 30 degrees has sin 30 degrees = 0.5, so the opposite side is 10 × 0.5 = 5 metres, and the base is 8.66 metres.
- A painter uses area, and a payroll clerk uses rate = pay divided by hours.
- A framer rearranges the Pythagorean formula, and a machinist uses circumference to recover a diameter.
- A common mistake is to put the 10 m diameter in place of r. That gives 3.14 × 100 = 314, four times too big.
- The radius is 5 metres, and the area is 3.14 × 25 = 78.5 square metres.



Yard width and pad area

- Find the width of a storage yard with a perimeter of 30 metres and a length of 8 metres.
- Correct the area of a circular pad with a diameter of 10 metres when the ticket squared that diameter in $A = \pi r^2$.

