

# Quantitative Methods

# Transformation of Formulae

Module No. Cons 1012

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# Transformation of Formulae

A formula is a mathematical expression in which symbols are used to solve problems for example Area of a circle =  $\pi R^2$ .

- Write down the formula and put in any information that is known.
- The formula can then be calculated out to give the answer.
- Sometimes a formula has to be rearranged before a calculation can be carried out. This rearranging process is called transposing the formula.
- When transposing a formula any part of it can be moved from one side of the equals sign to the other, but in doing so, each part of the formula that crosses the equals sign becomes the opposite of itself ie. plus sign changes to a minus, multiplication to division etc.
- Before transposing the formula the subject of the formula (unknown value) should be placed on the left hand side.

# Transformation of Formulae

- **Example 1** Express “ c ” as the subject
- $a = b + c + d$
- $b + c + d = a$
- $c = a - b - d$
- **Example 2** Express “ b ” as the subject
- $x + y = a - b + c$
- $a - b + c = x + y$
- $-b = x + y - a - c$
- You can't have a negative number as your subject so both sides will have to be multiplied by  $(-1)$
- $b = -x - y + a + c$
- It is usual to express the positive numbers before the negative ones.
- Answer
- $b = a + c - x - y$

# Transformation of Formulae Square

- **Example 1:** Calculate the perimeter of the square.
- The area of a square is  $121\text{m}^2$
- We need to get the square root of this number so find this symbol
- $\sqrt{121} = 11\text{m}$  one side is  $11\text{m}$
- Perm.  $11 \times 4 = 44\text{m}$  Ans Perm. is  $44\text{m}$



- **Example 2:** Calculate the perimeter of the square.
- The area of a square is  $66\text{m}^2$
- $\sqrt{66} = 8.12\text{m}$  one side is  $8.12\text{m}$
- Perm.  $8.12 \times 4 = 32.48\text{m}$  Ans Perm. is  $32.48\text{m}$
  
- **Example 3:** Calculate the perimeter of the rectangle.
- The area of a rectangle is  $48\text{m}^2$  short side is  $6\text{m}$
- $48 \div 6 = 8\text{m}$
- Perm.  $(6 + 8) \times 2 = 28\text{m}$  Ans Perm. is  $28\text{m}$

# Transformation of Formulae Triangle

- **Example 1:** Given the area and base Calculate the Perpendicular height.
- Area  $72\text{m}^2$  Base  $12\text{m}$
- Area of Triangle :  $\frac{1}{2}$  Base x Perp. Height
- $\frac{1}{2}$  base x Perp. Height = Area
- Perp. Height = Area  $\div$   $\frac{1}{2}$  Base
- Perp. Height =  $72 \div 6$
- Perp. Height =  $12\text{m}$       Ans Perp. Height is  $12\text{m}$

- **Example 2:** Given the area and Perp. height calculate the base.
- Area  $159.5\text{m}^2$  Perp. Height  $22\text{m}$
- Area of Triangle :  $\frac{1}{2}$  base x Perp. Height
- $\frac{1}{2}$  Base x Perp. Height = Area
- $\frac{1}{2}$  Base = Area  $\div$  Perp. Height
- $\frac{1}{2}$  Base =  $159.5 \div 22$
- $\frac{1}{2}$  Base =  $7.25\text{m}$
- Base =  $7.25 \times 2 = 14.5\text{m}$       Ans Base is  $14.5\text{m}$

# Transformation of Formulae Circle

- **Example 1:** Given Circumference 37.68m find the radius.
- $37.68\text{m} = 2 \times 3.14 \times r$
- $37.68 \div 2 = 3.14 \times r$   
 $18.84 = 3.14 \times r$
- $18.84 \div 3.14 = 6\text{m}$
- Ans radius is 6m
  
- **Example 2:** Given Circumference 125.68m find the radius.
- $125.68\text{m} = 2 \times 3.14 \times r$
- $125.68\text{m} \div 2 = 3.14 \times r$
- $62.84 = 3.14 \times r$
- $62.84 \div 3.14 = 20.01\text{m}$
- Ans radius is 20m

# Transformation of Formulae Circle

- **Example 3:** If the area of a circle is  $0.866\text{m}^2$
- What is the radius of the circle?
- $\pi r^2 = 0.866 \div \pi = 0.275$
- $\sqrt{0.275} = 0.525 = r$
- Calculate the length of the circumference
- $2\pi r = 2 \times \pi \times 0.525 = 3.298\text{m}$
  
- **Example 4:** If the circumference of a circle is  $2.3\text{m}$  in length.
- Determine the length of the radius.
- $2\pi r = 2.3 \div 2 = 1.15 \div \pi = 0.366\text{m} = r$
- Determine the area of the circle
- $\pi r^2 = \pi \times 0.366^2 = 0.42\text{m}^2$