IM-038 · Changing the subject I

IGCSE Mathematics (0580) · HomiLabs: Maths · Ep 038

Everything on this sheet is Core (C2.5.4) except the Challenge.

Set A · Fluency

1. Make x the subject of $y = 5x + 2$.

2. Make q the subject of $p = 7 - 3q$.

3. Make n the subject of $m = 4(n - 3)$.

4. Make h the subject of $k = (2h + 1)/3$.

5. Make v the subject of $w = 18/v$.

6. Make x the subject of $y = 10/x + 4$.

7. The perimeter of a rectangle is $P = 2(l + w)$. Make l the subject, then find l when $P = 30$ and $w = 6$.

8. The area of a triangle is $A = \frac{1}{2}bh$. Make b the subject, then find b when $A = 24$ and $h = 6$.

Set B · Exam style

1. (Paper 1 · no calculator) (C) Make x the subject of the formula $y = (3x - 4)/5$. [3]

2. (Paper 1 · no calculator) (C) The formula $v = u + at$ gives a final speed.
   (a) Make t the subject of the formula. [2]
   (b) Find t when $v = 3$, $u = 15$ and $a = -4$. [2]

3. (Paper 3 · calculator) (C) The cost, C dollars, of hiring a bike for h hours is $C = 4.75 + 2.4h$.
   (a) Make h the subject of the formula. [2]
   (b) Mia paid 15.07 dollars. For how many hours did she hire the bike? [1]

4. (Paper 3 · calculator) (C) The formula $d = 1000/(n + 5)$ is used in a factory.
   (a) Make n the subject of the formula. [3]
   (b) Find n when $d = 40$. [1]

Challenge

(E) A rectangle has perimeter P cm. Its length is 3 cm more than its width, w cm.
(a) Write a formula for P in terms of w, and make w the subject.
(b) Show that the area of the rectangle, A cm², is $A = (P^2 - 36)/16$. (Use the difference of two squares, Ep 26.)
(c) Find A when $P = 26$, and check your answer using the width and length.

Answers

Set A

1. $x = (y - 2)/5$

2. $3q = 7 - p$, $q = (7 - p)/3$

3. $n = m/4 + 3$ (or $(m + 12)/4$)

4. $3k = 2h + 1$, $h = (3k - 1)/2$

5. $v = 18/w$

6. $y - 4 = 10/x$, $x = 10/(y - 4)$

7. $l = P/2 - w$; $l = 15 - 6 = 9$

8. $b = 2A/h$; $b = 48/6 = 8$

Set B

1. $5y = 3x - 4$ M1; $5y + 4 = 3x$ M1; $x = (5y + 4)/3$ A1.

2. (a) $v - u = at$ M1; $t = (v - u)/a$ A1. (b) $t = (3 - 15)/(-4)$ M1; $t = 3$ A1.

3. (a) $C - 4.75 = 2.4h$ M1; $h = (C - 4.75)/2.4$ A1. (b) $10.32 \div 2.4 = 4.3$ hours B1.

4. (a) $d(n + 5) = 1000$ M1; $n + 5 = 1000/d$ M1; $n = 1000/d - 5$ A1. (b) $25 - 5 = 20$ B1.

Challenge

(a) $P = 2(w + w + 3) = 4w + 6$, so $w = (P - 6)/4$.
(b) Length $= w + 3 = (P + 6)/4$, so $A = (P - 6)(P + 6)/16 = (P^2 - 36)/16$.
(c) $A = (676 - 36)/16 = 640/16 = 40$. Check: $w = 5$, length 8, area $5 \times 8 = 40$.