Changing The Subject Of A Formula

Complete as many questions as you can from Exercise 5N in 10 minutes

EXERCISE 5N

HINTS AND TIPS

Remember about inverse operations, and the rule "change sides, change signs".

1. $T = 3k$ — Make k the subject.
2. $X = y - 1$ — Express y in terms of X.
3. $Q = \frac{p}{3}$ — Express p in terms of Q.
4. $A = 4r + 9$ — Make r the subject.
5. $W = 3n - 1$ — Make n the subject.
6. $p = m + t$ — **a** Make m the subject. **b** Make t the subject.
7. $g = \frac{m}{v}$ — Make m the subject.
8. $t = m^2$ — Make m the subject.
9. $C = 2\pi r$ — Make r the subject.
10. $A = bh$ — Make b the subject.
11. $P = 2l + 2w$ — Make l the subject.
12. $m = p^2 + 2$ — Make p the subject.
13. $v = u + at$ — **a** Make a the subject. **b** Make t the subject.
14. $A = \frac{1}{4}\pi d^2$, — Make d the subject.
15. $W = 3n + t$ — **a** Make n the subject. **b** Express t in terms of n and W.
16. $x = 5y - w$ — **a** Make y the subject. **b** Express w in terms of x and y.
17. $k = 2p^2$ — Make p the subject.
18. $v = u^2 - t$ — **a** Make t the subject. **b** Make u the subject.
19. $k = m + n^2$ — **a** Make m the subject. **b** Make n the subject.
20. $T = 5r^2$ — Make r the subject.
21. $K = 5n^2 + w$ — **a** Make w the subject. **b** Make n the subject.

EXERCISE 20G

In questions **1** to **10**, make the letter in brackets the subject of each formula.

1 $3(x + 2y) = 2(x - y)$ (x)

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

3 $5 = \dfrac{a + b}{a - c}$ (a)

4 $p(a + b) = q(a - b)$ (a)

5 $p(a + b) = q(a - b)$ (b)

6 $A = 2\pi rh + \pi rk$ (r)

7 $v^2 = u^2 + av^2$ (v)

8 $s(t - r) = 2r - 3$ (r)

9 $s(t - r) = 2(r - 3)$ (r)

10 $R = \dfrac{x - 3}{x - 2}$ (x)

1) $3(x+2y) = 2(x-y)$ (x)

$3x + 6y = 2x - 2y$

$3x - 2x = -2y - 6y$

$x = -8y$

3) $5 = \dfrac{a+b}{a-c}$ (a)

$5(a-c) = a+b$

$5a - 5c = a+b$

$5a - a = b + 5c$

$4a = b + 5c$

$a = \dfrac{b+5c}{4}$

5) $p(a+b) = q(a-b)$ (b)

$$pa + pb = qa - qb$$
$$pb + qb = qa - pa$$
$$b(p+q) = qa - pa$$
$$b = \frac{qa - pa}{p+q} \quad \text{or} \quad \frac{a(q-p)}{p+q}$$

---

7) $v^2 = u^2 + av^2$ $\quad (v)$

$$v^2 - av^2 = u^2$$
$$v^2(1-a) = u^2$$
$$v^2 = \frac{u^2}{1-a}$$
$$v = \pm\sqrt{\frac{u^2}{1-a}}$$

---

9) $s(t-r) = 2(r-3)$ $\quad (r)$

$$st - sr = 2r - 6$$
$$st + 6 = 2r + sr$$
$$st + 6 = r(2+s)$$
$$\frac{st+6}{2+s} = r \quad \text{or} \quad r = \frac{-st-6}{-2-s}$$

Classwork

2) **2** $3(x + 2y) = 2(x - y)$ (y)

$$3x + 6y = 2x - 2y$$

$$6y + 2y = 2x - 3x$$

$$8y = -x$$

$$y = -\frac{x}{8}$$

---

4) **4** $p(a + b) = q(a - b)$ (a)

$$pa + pb = qa - qb$$

$$pa - qa = -qb - pb$$

$$a(p - q) = -qb - pb$$

$$a = \frac{-qb - pb}{p - q} \quad \text{or} \quad \frac{qb + pb}{q - p} \quad \text{or} \quad \frac{b(q + p)}{q - p}$$

---

6) **6** $A = 2\pi rh + \pi rk$ (r)

$$A = r(2\pi h + \pi k)$$

$$\frac{A}{2\pi h + \pi k} = r \quad \text{or} \quad r = \frac{A}{\pi(2h + k)}$$

---

8) **8** $s(t - r) = 2r - 3$ (r)

$st - sr = 2r - 3$

$st + 3 = 2r + sr$

$st + 3 = r(2+s)$

$\frac{st+3}{2+s} = r$ $\qquad$ $r = \frac{st+3}{2+s}$

---

10) **10** $R = \frac{x-3}{x-2}$ (x)

$R(x-2) = x - 3$

$Rx - 2R = x - 3$

$Rx - x = 2R - 3$

$x(R-1) = 2R - 3$

$x = \frac{2R-3}{R-1}$

Actual Exam Questions

Q3 $\quad a + 3 = \frac{2a+7}{r}$ $\quad (r)$

Q5 $\quad p = \frac{3a+5}{4-a}$ $\quad (a)$

Q6 $\quad p = \frac{3-t}{4+t}$ $\quad (t)$

Q7 $\quad k = \frac{2(t+3)}{t-3}$ $\quad (t)$

Q8 $f = \dfrac{4-3m}{5+m}$ (m)

Q9 $y = \dfrac{x^2+9}{x^2-7}$ (x)

Solutions

Q3 $a+3 = \dfrac{2a+7}{r}$ (r)

$r(a+3) = 2a+7$

$r = \dfrac{2a+7}{a+3}$

Q5 $p = \dfrac{3a+5}{4-a}$ (a)

$p(4-a) = 3a+5$

$4p - pa = 3a+5$

$4p-5 = 3a+pa$

$4p-5 = a(3+p)$

$\dfrac{4p-5}{3+p} = a$

$a = \dfrac{4p-5}{3+p}$ or $a = \dfrac{5-4p}{-3-p}$
