IGCSE– Factorising and expanding brackets

Oct 01 Paper 2

10 (a) Factorise **completely** $6x^2 + 6x$.

Answer (a) $6x(x+1)$ [1]

(b) Factorise $6x^2 + 5x + 1$.

$\times 6$
$+5$
$(2 \& 3)$

$6x^2 + 2x + 3x + 1$

$2x(3x+1) + 1(3x+1)$ → $(2x+1)(3x+1)$

Answer (b) ..... [2]

May 02 Paper 2

20 (a) Factorise

(i) $x^2 - 5x$,

Answer (a)(i) $x(x-5)$ [1]

(ii) $2x^2 - 11x + 5$.

$\times 10$
-11
$(-10 \& -1)$

$2x^2 - 10x - x + 5$

$2x(x-5) - 1(x-5)$

Answer (a)(ii) $(2x-1)(x-5)$ [2]

look above to help

(b) Simplify $\dfrac{x^2 - 5x}{2x^2 - 11x + 5}$.

$$\frac{x\cancel{(x-5)}}{(2x-1)\cancel{(x-5)}}$$

Answer (b) $\dfrac{x}{2x-1}$ [2]

Oct 05 Paper 2

14 Factorise completely

(a) $7ac + 14a$,

$7a(c+2)$

Answer(a) $7a(c+2)$ [1]

(b) $12ax^3 + 18xa^3$.

Answer(b) $6ax(2x^2+3a^2)$ [2]

19 Factorise

May 06 Paper 2

(a) $4x^2 - 9$, difference between 2 squares

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

Answer(a) ..... [1]

(b) $4x^2 - 9x$, – common factors

$x(4x-9)$

Answer(b) $x(4x-9)$ [1]

(c) $4x^2 - 9x + 2$. $\times 8$ $+ -9$ -8 and -1

$4x^2 - 8x - x + 2$

$4x(x-2) - 1(x-2)$

$(4x-1)(x-2)$

Answer(c) $(4x-1)(x-2)$ [2]

May 04 Paper 2

20 (a) Factorise completely $12x^2 - 3y^2$. $3(4x^2 - y^2)$ difference b/w 2 squares

Answer(a) $3(2x-y)(2x+y)$ [2]

May 04 Paper 2

(b) (i) Expand $(x-3)^2$. $\rightarrow$ $(x-3)(x-3)$

$x^2 - 3x - 3x + 9$

Answer(b)(i) $x^2 - 6x + 9$ [2]

May 04 Paper 2

(ii) $x^2 - 6x + 10$ is to be written in the form $(x-p)^2 + q$.
Find the values of p and q.

$(x-3)^2 - (3)^2 + 10$

$(x-3)^2 - 9 + 10$

$(x-3)^2 + 1$

Answer(b)(ii) $p =$ 3 $q =$ 1 [2]

IGCSE – Solving equations and inequalities

May 04 Paper 2

5 Solve the equation

$$\frac{x}{4} - 8 = -2.$$

$x - 32 = -8$

Answer $x =$ 24 [2]

Oct 04 Paper 2

5 Solve the equation

$$\frac{3x-2}{5} = 8.$$

$3x - 2 = 40$
$3x = 42$
$x =$

Answer $x =$ $x = 14$ [2]

May 06 Paper 2

13 Solve the equation

$$\frac{x-2}{4} = \frac{2x+5}{3}.$$

$3(x-2) = 4(2x+5)$
$3x - 6 = 8x + 20$
$-26 = 5x$
$x = \frac{26}{5}$

Answer $x =$ -5.2 [3]

May 05 Paper 2

19 Solve

(a) $0.2x + 3.6 = 1.2,$

$0.2x = 1.2 - 3.6$
$0.2x = -2.4$
$x = \frac{-2.4}{0.2}$

Answer (a) $x =$ -12 [2]

(b) $\frac{2-3x}{5} < x + 2.$

$2 - 3x < 5(x+2)$
$2 - 3x < 5x + 10$
$-8 < 8x$
$-1 < x$

Answer (b) $x > -1$ [3]

May 02 Paper 2

8 Solve the inequality

$$3(x+7) < 5x - 9.$$

$3x + 21 < 5x - 9$

$21 + 9 < 5x - 3x$

$30 < 2x$

$15 < x$

Answer $x > 15$ [2]

Oct 02 Paper 2

19 (a) Solve the inequality $5 - \frac{2x}{3} > \frac{1}{2} + \frac{x}{4}$.

$12(5) - \cancel{12}^{4}\left(\frac{2}{\cancel{3}}x\right) > \cancel{12}^{6}\left(\frac{1}{\cancel{2}}\right) + \cancel{12}^{3}\left(\frac{x}{\cancel{4}}\right)$

$60 - 8x > 6 + 3x$

$54 > 3x + 8x$

$54 > 11x$

$\frac{54}{11} > x$

Answer (a) x $x < 4.91$ [3]

(b) List the positive integers which satisfy the inequality

$$5 - \frac{2x}{3} > \frac{1}{2} + \frac{x}{4}.$$

$\cancel{12(5) - (12)\frac{2}{3}}$

Answer (b) 4, 3, 2, 1 [1]

May 03 Paper 2

7 Solve the inequality $3 < 2x - 5 < 7$.

$3 + 5 < 2x < 7 + 5$

$8 < 2x < 12$

Answer 4 $< x <$ 6 [2]

Oct 04 Paper 2

4 Solve the inequality

$$5 - 3x < 17.$$

$5 - 17 < 3x$

$-12 < 3x$

$\frac{-12}{3} < \frac{3x}{3}$

Answer $x > -4$ [2]

Oct 05 Paper 2

16 Solve the inequality

$$4 - 5x < 2(x+4).$$

$4 - 5x < 2x + 8$

$4 - 8 < 2x + 5x$

$-4 < 7x$

$-\frac{4}{7} < x$

Answer $x > -0.57$ [3]

IGCSE – Solving quadratics – factorising & quad formula

Oct 04 Paper 2

17 Solve the equation

$$x^2 + 4x - 22 = 0.$$

Give your answers correct to 2 decimal places.
Show all your working.

2d.p. use the Quad formula.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-4 \pm \sqrt{16 - 4(1)(-22)}}{2}$$

2d.p

$$x = \frac{-4 \pm \sqrt{104}}{2}$$

Answer x = 3.10 or x = −7.10 [4]

Oct 06 Paper 2

17 Solve the equations

(a) $0.2x - 3 = 0.5x$,

$$0.5x - 0.2x = -3$$
$$0.3x = -3$$
$$x = \frac{-3}{0.3}$$

Answer(a) x = −10 [2]

(b) $2x^2 - 11x + 12 = 0$.

$$(x - 4)(2x - 3) = 0$$

$$x - 4 = 0 \qquad 2x - 3 = 0$$
$$x = 4 \qquad 2x = 3$$
$$x = \frac{3}{2}$$

Answer(b) x = 4 or x = $\frac{3}{2}$ [3]

Oct 05 Paper 2

23 **Showing all your working, solve**

(a) $\frac{5x}{2} - 9 = 0$,

$$\frac{5x}{2} = 9$$
$$5x = 18$$
$$x = \frac{18}{5}$$

Answer(a) x = 3.6 [2]

(b) $x^2 + 12x + 3 = 0$, giving your answers correct to 1 decimal place. – QUAD FORMULA.

$$x = \frac{-12 \pm \sqrt{(12)^2 - 4(1)(3)}}{2}$$

$$x = \frac{-12 \pm \sqrt{144 - 12}}{2}$$

$$x = \frac{-12 \pm \sqrt{132}}{2}$$

Answer(b) x = −0.3 or x = −11.7 [4]

IGCSE – Changing the Subject

Oct 01 Paper 2

18 Make x the subject of the formula

$$y = \frac{3x}{2} + 5.$$

$2y = 3x + 10$

$3x = 2y - 10$

Answer $x = \frac{2y - 10}{3}$ [3]

May 02 Paper 2

11 Make V the subject of the formula $T = \frac{5}{V+1}$.

$(V+1)T = 5$

$VT + T = 5$ $\quad VT = 5 - T$

$V = \frac{5-T}{T}$

Answer $V =$ ..... [3]

May 04 Paper 2

13 Make d the subject of the formula

$$c = kd^2 + e.$$

$kd^2 = c - e$

$d^2 = \frac{c-e}{k}$

Answer $d = \sqrt{\frac{c-e}{k}}$ [3]

Oct 04 Paper 2

12 Make c the subject of the formula

$$\sqrt{3c - 5} = b.$$

$3c - 5 = b^2$

$3c = b^2 + 5$

Answer $c = \frac{b^2+5}{3}$ [3]

Oct 05 Paper 2

12 Make d the subject of the formula

$$c = \frac{d^3}{2} + 5.$$

$2c = d^3 + 10$

$d^3 = 2c - 10$

Answer $d = \sqrt[3]{2c - 10}$ [3]

IGCSE – Simultaneous Equations

Oct 02 Paper 2

15 Solve the simultaneous equations

① $4x + 5y = 0$,
② $8x - 15y = 5$.

$3\times$① $12x + 15y = 0$
② $8x - 15y = 5$
(+) $20x = 5$
$\boxed{x = \frac{1}{4}}$

$x \to$ ① $4(\frac{1}{4}) + 5y = 0$
$1 = -5y$
$\boxed{y = -\frac{1}{5}}$

← OR →

$2\times$① $8x + 10y = 0$
② $8x - 15y = 5$
(−) $25y = -5$
$\boxed{y = -\frac{1}{5}}$

$y \to$ ① $4x + 5(-\frac{1}{5}) = 0$
$4x =$
$\boxed{x = \frac{1}{4}}$

Answer $x =$ $\frac{1}{4} = 0.25$
$y =$ $-\frac{1}{5} = -0.2$ [4]

May 04 Paper 2

11 Solve the simultaneous equations

① $\frac{1}{2}x + y = 5$,
② $x - 2y = 6$.

$2\times$① $x + 2y = 5$
② $x - 2y = 6$
(+) $2x = 16$
$\boxed{x = 8}$

$x \to$ ① $\frac{1}{2}(8) + y = 5$
$\boxed{y = 1}$

Answer $x =$ 8 $y =$ 1 [3]

May 05 Paper 2

8 Solve the simultaneous equations

① $\frac{1}{2}x + 2y = 16$,
② $2x + \frac{1}{2}y = 19$.

$4\times$① $2x + 8y = 64$
② $2x + \frac{1}{2}y = 19$
(−) $7.5y = 45$
$\boxed{y = 6}$

$y \to$ ② $2x + \frac{1}{2}(6) = 19$
$2x = 16$
$\boxed{x = 8}$

Answer $x =$ 8
$y =$ 6 [3]

May 06 Paper 2

12 Solve the simultaneous equations

① $0.4x + 2y = 10$,
② $0.3x + 5y = 18$.

$3\times$① $1.2x + 6y = 30$
$4\times$② $1.2x + 20y = 72$
(−) $14y = 42$
$\boxed{y = 3}$

$y \to$ ① $0.4x + 2(3) = 10$
$0.4x = 4$
$\boxed{x = 10}$

Answer $x =$ 10
$y =$ 3 [3]

$\boxed{\text{REMEMBER}}$: the two equations must line up before you begin elimination. E.g: ① $4x - 3y + 5 = 0$
② $y = x - 15$ $\Rightarrow$ ① $4x - 3y = -5$
② $x - y = 15$
(or: ② $-x + y = -15$)

IGCSE– Forming an equation/ solving quads & quad formula

Oct 04 Paper 4

5 Maria walks 10 kilometres to a waterfall at an average speed of x kilometres per hour.

(a) Write down, in terms of x, the time taken in hours. [1]

(b) Maria returns from the waterfall but this time she walks the 10 kilometres at an average speed of $(x + 1)$ kilometres per hour. The time of the return journey is 30 minutes less than the time of the first journey.
Write down an equation in x and show that it simplifies to $x^2 + x - 20 = 0$. [4]

(c) Solve the equation $x^2 + x - 20 = 0$. [2]

(d) Find the time Maria takes to walk to the waterfall. [2]

Nov 02. P. 4.

6 (a) On 1st January 2000, Ashraf was x years old.
Bukki was 5 years older than Ashraf and Claude was twice as old as Ashraf.

(i) Write down in terms of x, the ages of Bukki and Claude on 1st January 2000. [2]

(ii) Write down in terms of x, the ages of Ashraf, Bukki and Claude on 1st January 2002. [1]

(iii) The product of Claude's age and Ashraf's age on 1st January 2002 is the same as the square of Bukki's age on 1st January 2000.
Write down an equation in x and show that it simplifies to $x^2 - 4x - 21 = 0$. [4]

(iv) Solve the equation $x^2 - 4x - 21 = 0$. [2]

(v) How old was Claude on 1st January 2002? [1]

(b) Claude's height, h metres, is one of the solutions of $h^2 + 8h - 17 = 0$.

(i) Solve the equation $h^2 + 8h - 17 = 0$.
Show all your working and give your answers correct to 2 decimal places. [4]

(ii) Write down Claude's height, to the nearest centimetre. [1]

Oct 05 Paper 4

8 (a) (i) The cost of a book is \$$x$.
Write down an expression in terms of x for the number of these books which are bought for \$40. [1]

(ii) The cost of each book is increased by \$2.
The number of books which are bought for \$40 is now one less than before.
Write down an equation in x and show that it simplifies to $x^2 + 2x - 80 = 0$. [4]

(iii) Solve the equation $x^2 + 2x - 80 = 0$. [2]

(iv) Find the original cost of one book. [1]

(b) Magazines cost \$$m$ each and newspapers cost \$$n$ each.
One magazine costs \$2.55 more than one newspaper.
The cost of two magazines is the same as the cost of five newspapers.

(i) Write down two equations in m and n to show this information. [2]

(ii) Find the values of m and n. [3]

FORMING AN EQUATION / SOLVING QUADS & QUAD FORMULA.

6)

i) Ashraf → x
Bukki → $x+5$
Claude → $2x$

ii) Ashraf → $x+2$
Bukki → $x+7$
Claude → $2x+2$

iii) $(2x+2)(x+2) = (x+5)^2$

Claude Ashraf $(x+5)(x+5)$

$2x^2+2x+4x+4 = x^2+10x+25$

$2x^2+6x+4 = x^2+10x+25$
$x^2-4x-21=0$

iv) $(x-7)(x+3)=0$
$x-7=0$ $x+3=0$
$x=7$ $x=-3$

v) $2(7)+2$
$14+2 = 16$ years

bi) $h = \dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$

$h = \dfrac{-8 \pm \sqrt{64-4(1)(-17)}}{2}$

$h = \dfrac{-8 \pm \sqrt{132}}{2}$

$h = \dfrac{-8 \pm 11.489}{2}$

$h = 1.7445$ or -9.7445

$h = 1.74$ or -9.74 (2dp)

ii) 1.74m 174cm

8)

ai) $\dfrac{40}{x}$

ii) $\dfrac{40}{x+2} = \dfrac{40}{x} - 1$

$40x = 40(x+2) - x(x+2)$
$40x = 40x + 80 - x^2 - 2x$
$x^2 - 2x - 80 = 0$

iii) $(x+10)(x-8)=0$

$x+10=0$ $x-8=0$
$x=-10$ $x=8$

iv) $x=8$ cannot be negative

b) $m = n + 2.55$

$2m = 5n$
$2m = 2n + 5.50$

$0 = 3n - 5.50$
$3n = 5.50$
$n = 1.7$

$m = 1.7 + 2.55$
$m = 4.25$