AQA Level 2 Further mathematics Number & algebra

Section 2: Algebraic manipulation

Section test

1) The expression $8x^2y^3 - 4x^3y^4 - 2x^2y$ can be written in fully factorised form as

(a) $2x^2y\left(4y^2 - 2xy^3 - 1\right)$
(b) $2x^2y\left(4y^2 - 2xy^3\right)$
(c) $xy\left(8y^2 - 4xy^3 - 2\right)$
(d) $2x^2y\left(6y^2 - 2xy^3 - 1\right)$
(e) I don't know

2) The expression $\dfrac{y^2 - 1}{y^2 - y - 2}$ can be simplified to

(a) $\dfrac{y+1}{y+2}$
(b) $\dfrac{y-1}{y-2}$
(c) $\dfrac{1}{y+2}$
(d) cannot be simplified
(e) I don't know

3) $\dfrac{2x}{3y^3} \times \dfrac{6y}{x^2 + 2x}$, expressed in its simplest form, is

(a) $\dfrac{2}{x^2y^2}$
(b) $\dfrac{4}{y^2(x+2)}$
(c) $\dfrac{4}{x^2}$
(d) $\dfrac{4}{x^2y^2 + 2}$
(e) I don't know

4) $\dfrac{x^2y}{2z} \div \dfrac{3xy^3}{10z^2}$, expressed in its simplest form, is

(a) $\dfrac{3x^3y^4}{20z^3}$
(b) $\dfrac{8xz}{3y^2}$
(c) $\dfrac{5xz}{3y^2}$
(d) $\dfrac{3y^2}{5xz}$
(e) I don't know

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5) $\frac{5}{x+2}-\frac{3}{2x-1}=$

(a) $\frac{7x-7}{(x+2)(2x-1)}$ (b) $\frac{7x+1}{(x+2)(2x-1)}$

(c) $\frac{7x-11}{(x+2)(2x-1)}$ (d) $\frac{2}{(x+2)(2x-1)}$

(e) I don't know

6) Make u the subject of the formula $s=\frac{1}{2}(u+v)t$.

(a) $u=2\left(\frac{s-v}{t}\right)$ (b) $u=\frac{2s-v}{t}$

(c) $u=2\left(\frac{s}{t}-v\right)$ (d) $u=\frac{2s}{t}-v$

(e) I don't know

7) Make x the subject of the formula $g=\frac{1}{\sqrt{a^2-x^2}}$

(a) $x=\sqrt{\frac{1}{g^2}-a^2}$ (b) $x=\sqrt{\frac{a^2-1}{g^2}}$

(c) $x=\sqrt{a^2-\frac{1}{g^2}}$ (d) $x=\sqrt{\frac{1-a^2}{g^2}}$

(e) I don't know

8) Make a the subject of the formula $b=\frac{a+x}{a+c}$

(a) $a=\frac{bc-x}{b-1}$ (b) $a=\frac{x-bc}{b-1}$

(c) $a=\frac{x-bc}{b+1}$ (d) $a=\frac{bc-x}{b+1}$

(e) I don't know

9) The quadratic expression x^2-2x-3 can be written in the form

(a) $(x+1)^2-4$ (b) $(x-1)^2-4$

(c) $(x-1)^2-3$ (d) $(x-1)^2-2$

(e) I don't know

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10) The quadratic expression $2x^2 + 6x + 1$ can be written in the form

(a) $2(x+\frac{3}{2})^2 - \frac{7}{2}$

(b) $2(x + 3)^2 - 8$

(c) $(2x + 3)^2 - 8$

(d) $(2x+\frac{3}{2})^2 - \frac{5}{4}$

(e) I don't know

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Solutions to section test

1) The correct answer is (a)

$$8x^2y^3 - 4x^3y^4 - 2x^2y = 2x^2y\left(4y^2 - 2xy^3 - 1\right)$$

2) The correct answer is (b)

$$\frac{y^2-1}{y^2-y-2} = \frac{\cancel{(y+1)}(y-1)}{(y-2)\cancel{(y+1)}} = \frac{y-1}{y-2}$$

3) The correct answer is (b)

$$\frac{2x}{3y^3} \times \frac{6y}{x^2+2x} = \frac{2x}{3y^3} \times \frac{6y}{x(x+2)}$$

$$= \frac{2\cancel{x}}{\cancel{3}y^{\cancel{3}2}} \times \frac{^{2}\cancel{6}\,\cancel{y}}{\cancel{x}(x+2)}$$

$$= \frac{4}{y^2(x+2)}$$

4) The correct answer is (c)

$$\frac{x^2y}{2z} \div \frac{3xy^3}{10z^2} = \frac{x^2y}{2z} \times \frac{10z^2}{3xy^3}$$

$$= \frac{x^{\cancel{2}}\,\cancel{y}}{\cancel{2}\,\cancel{z}} \times \frac{^{5}\cancel{10}z^{\cancel{2}}}{3\cancel{x}y^{\cancel{3}2}}$$

$$= \frac{5xz}{3y^2}$$

5) The correct answer is (c)

The common denominator is $(x+2)(2x-1)$

$$\frac{5}{x+2}-\frac{3}{2x-1}=\frac{5(2x-1)-3(x+2)}{(x+2)(2x-1)}$$
$$=\frac{10x-5-3x-6}{(x+2)(2x-1)}$$
$$=\frac{7x-11}{(x+2)(2x-1)}$$

6) The correct answer is (d)

$s=\frac{1}{2}(u+v)t$

$2s=(u+v)t$

$\frac{2s}{t}=u+v$

$\frac{2s}{t}-v=u$

$u=\frac{2s}{t}-v$

7) The correct answer is (c)

$g=\frac{1}{\sqrt{a^2-x^2}}$

$g\sqrt{a^2-x^2}=1$

$\sqrt{a^2-x^2}=\frac{1}{g}$

$a^2-x^2=\frac{1}{g^2}$

$a^2=\frac{1}{g^2}+x^2$

$a^2-\frac{1}{g^2}=x^2$

$x=\sqrt{a^2-\frac{1}{g^2}}$

8) The correct answer is (b)

$$b = \frac{a + x}{a + c}$$
$$b(a + c) = a + x$$
$$ab + bc = a + x$$
$$ab = a + x - bc$$
$$ab - a = x - bc$$
$$a(b - 1) = x - bc$$
$$a = \frac{x - bc}{b - 1}$$

9) The correct answer is (b)

$$x^2 - 2x - 3 = (x - 1)^2 - 1 - 3$$
$$= (x - 1)^2 - 4$$

10) The correct answer is (a)

$$2x^2 + 6x + 1 = 2(x^2 + 3x) + 1$$
$$= 2\left((x + \tfrac{3}{2})^2 - \tfrac{9}{4}\right) + 1$$
$$= 2(x + \tfrac{3}{2})^2 - \tfrac{9}{2} + 1$$
$$= 2(x + \tfrac{3}{2})^2 - \tfrac{7}{2}$$