Q1

Remove the fraction (by multiplying both sides by $y + 2$)

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

[1]

Expand the brackets (by multiplying the terms inside by t)

$$ty + 2t = 2 - 3y$$

Collect the y terms on one side (for example, by adding $3y$ to both sides then subtracting $2t$ from both sides)

$$ty + 2t + 3y = 2$$
$$ty + 3y = 2 - 2t$$

[1]

Factorise y out of the terms on the left

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

[1]

Get y on its own (by dividing both sides by $t + 3$)

$$y = \frac{2-2t}{t+3}$$ [1]

$y = \frac{2t-2}{-t-3}$ is also accepted

Q2

2

Remove fractions (by multiplying both sides by v)

$$wv = 15(t - 2v)$$

[1]

Expand the brackets (by multiplying the terms inside by 15)

$$wv = 15t - 30v$$

Move the v terms to one side (for example, by adding $30v$ to both sides)

$$wv + 30v = 15t$$

Factorise v out of the terms on the left

$$v(w + 30) = 15t$$

[1]

Get v on its own (by dividing both sides by $w + 30$)

$$v = \frac{15t}{w+30}$$ [1]

Q3

Remove fractions (by multiplying both sides by *r*)

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

[1]

Expand the brackets (by multiplying the terms inside by *r*)

$$ra+3r=2a+7$$

Move the *a* terms to one side (for example, by subtracting 2*a* from both sides)

$$ra+3r-2a=7$$

Get the *a* terms on their own (by subtracting 3*r* from both sides)

$$ra-2a=7-3r$$

Factorise *a* out of the terms on the left

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

[1]

Get *a* on its own (by dividing both sides by *r* - 2)

$$\boldsymbol{a=\frac{7-3r}{r-2}}$$ [1]

$a=\frac{3r-7}{2-r}$ is also accepted

Q4

4

Remove the square-root sign (by squaring both sides)

$$m^2=\frac{k^3+1}{4}$$

[1]

Remove fractions (by multiplying both sides by 4)

$$4m^2=k^3+1$$

Get k^3 on its own (by subtracting 1 from both sides)

$$4m^2-1=k^3$$

Get *k* on its own (by cube-rooting both sides)

$$\sqrt[3]{4m^2-1}=k$$

attempting to cube root [1]

$$\boldsymbol{k=\sqrt[3]{4m^2-1}}$$ [1]

Q5

5

Remove fractions (by multiplying both sides by (4 - *a*)

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

[1]

Expanding the brackets (by multiplying each term inside by *p*)

$$4p-pa=3a+5$$

Get the *a* terms on one side (for example, by adding *pa* to both sides then subtracting 5 from both sides)

$$4p=3a+5+ap$$
$$4p-5=3a+ap$$

[1]

Factorise *a* out of the terms on the right

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

[1]

Get *a* on its own (by dividing both sides by 3 + *p*)

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

$a=\frac{4p-5}{3+p}$ [1]

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

$a=\frac{4p-5}{3+p}$ [1]

$a=\frac{5-4p}{-3-p}$ is also accepted

Q6

6

Remove fractions (by multiplying both sides by 4 + *t*)

$$p(4+t)=3-2t$$

[1]

Expand the brackets (by multiplying each term inside by *p*)

$$4p+pt=3-2t$$

Move the *t* terms to one side (for example, by adding 2*t* to both sides then subtracting 4*p* from both sides)

$$4p+pt+2t=3$$
$$pt+2t=3-4p$$

[1]

Factorise *t* out of the terms on the left

$$t(p+2)=3-4p$$

[1]

Get *t* on its own (by dividing both sides by *p* + 2)

$$t=\frac{3-4p}{p+2}$$ [1]

$t=\frac{4p-3}{-p-2}$ is also accepted

Q7

Get rid of fractions (by multiplying both sides by *bvR*)

$$bvR\left(\frac{m}{v}-\frac{t}{b}\right)=bvR\times\frac{(m-t)}{R}$$

$$\frac{b\cancel{v}Rm}{\cancel{v}}-\frac{\cancel{b}vRt}{\cancel{b}}=\frac{bv\cancel{R}(m-t)}{\cancel{R}}$$

$$bRm-vRt=bv(m-t)$$

[1]

Expand the brackets on the right

$$bRm-vRt=bvm-bvt$$

Move all the *m* terms on to one side (for example, by subtracting *bvm* from both sides then adding *vRt* to both sides)

$$bRm-vRt-bvm=-bvt$$
$$bRm-bvm=vRt-bvt$$

[1]

Factorise *m* out of the terms on the left

$$m(bR-bv)=vRt-bvt$$

[1]

Get *m* on its own (by dividing both sides by *bR* - *bv*)

$$m=\frac{vRt-bvt}{bR-bv}$$ [1]

$$m = \frac{vRt - bvt}{bR - bv}$$ [1]

$$m = \frac{bvt - vRt}{bv - bR}$$ is also accepted

Q8

8

Remove fractions (by multiplying both sides by m - 1)

$$f(m-1) = 3m + 4$$

[1]

Expand the brackets (by multiplying each term inside by f)

$$fm - f = 3m + 4$$

Get all the m terms on one side (for example, by subtracting 3m from both sides then adding f to both sides)

$$fm - f - 3m = 4$$
$$fm - 3m = 4 + f$$

[1]

Factorise m out of the terms on the left

$$m(f-3) = 4 + f$$

Get m on its own (by dividing both sides by f - 3)

$$m = \frac{4+f}{f-3}$$ [1]

$$m = \frac{-f-4}{3-f}$$ is also accepted

Q9

9

Remove fractions (by multiplying both sides by t^3)

$$t^3n^2 = 4d + t^3$$

[1]

Collect all the terms in t on one side (subtract t^3 from both sides)

$$t^3n^2 - t^3 = 4d$$

'Factorise out' the the t^3

$$t^3(n^2 - 1) = 4d$$

[1]

And divide both sides by '$n^2 - 1$' to leave t^3 on its own on the left hand side

$$t^3 = \frac{4d}{n^2 - 1}$$

[1]

Take the cube root of both sides

$$\boldsymbol{t = \sqrt[3]{\frac{4d}{n^2 - 1}}}$$ [1]

Q10

Start by squaring both sides to remove the square root.

$$p^2 = \frac{ac + 8}{3 + c}$$

[1]

Remove fractions by multiplying (both sides) by $3 + c$.

$$p^2(3 + c) = ac + 8$$

Expand the brackets by multiplying each term inside by p^2.

$$3p^2 + cp^2 = ac + 8$$

[1]

Being all the c terms to one side (for example, by subtracting ac from both sides then adding $3p^2$ to both sides)

$$3p^2 + cp^2 - ac = 8$$
$$cp^2 - ac = 8 - 3p^2$$

[1]

Factorise c from the terms on the left-hand side.

$$c(p^2 - a) = 8 - 3p^2$$

Isolate c by dividing (both sides) by p^2 - a.

$$c = \frac{8 - 3p^2}{p^2 - a}$$

There is nothing to simplify or rearrange so this is the final answer.

$$\boldsymbol{c = \frac{8 - 3p^2}{p^2 - a}}$$ [1]

There is nothing to simplify or rearrange so this is the final answer.

$$c = \frac{8 - 3p^2}{p^2 - a}$$ [1]

Equivalent expressions allowed such as $c = \frac{3p^2 - 8}{a - p^2}$.

Q11

Remove the square root by squaring both sides.

$$y^2 = \frac{x+1}{x-4}$$

[1]

Remove the fraction by multiplying both sides by the denominator (x - 4).

$$y^2(x-4) = x+1$$

[1]

Expand the brackets on the left hand side of the formula.

$$xy^2 - 4y^2 = x + 1$$

Collect x terms on the same side of the formula - and everything else on the other side (by subtracting x from, and adding $4y^2$ to, both sides)

$$xy^2 - x = 4y^2 + 1$$

[1]

Factorise x out of the terms on the left hand side

$$x(y^2 - 1) = 4y^2 + 1$$

Get x on its own (by dividing both sides by y^2 - 1)

Get x on its own (by dividing both sides by y^2 - 1)

$$x = \frac{4y^2 + 1}{y^2 - 1}$$

$$x = \frac{4y^2 + 1}{y^2 - 1}$$ [1]

Q12

12

Remove the fraction by multiplying both sides by the denominator (n^2).

$$yn^2 = n^2 + d$$

[1]

Collect n terms on the same side of the formula (by subtracting n^2 from both sides).

$$yn^2 - n^2 = d$$

[1]

Factorise n^2 out of the terms on the left hand side.

$$n^2(y-1) = d$$

[1]

Get n^2 on its own (by dividing both sides by y - 1).

$$n^2 = \frac{d}{y-1}$$

Now square root, but we are given that $n > 0$ so we only need the positive square root.

$\mathbf{n = \sqrt{\frac{d}{y-1}}}$ [1]

Q13

13

First square both sides of the formula to remove the square root.

$$y^2 = \left(\frac{1}{\sqrt{x+1}}\right)^2$$
$$y^2 = \frac{(1)^2}{(\sqrt{x+1})^2}$$
$$y^2 = \frac{1}{x+1}$$

[1]

Multiply both sides by the denominator to remove the fraction.

$$y^2(x+1) = 1$$

[1]

Expand the brackets on the left-hand side.

$$xy^2 + y^2 = 1$$

Isolate the x term by subtracting y^2 from both sides.

$$xy^2 = 1 - y^2$$

Finally divide both sides by y^2 to make x the subject.

$$x = \frac{1-y^2}{y^2}$$

$\mathbf{x = \frac{1-y^2}{y^2}}$ [1]