SOLUTIONS

1. Multiply the brackets and simplify

$$(3x-1)(x^2-2x+3)$$ 3

Multiply the brackets

$$=3x^3-6x^2+9x-x^2+2x-3$$

Simplify

$$=3x^3-7x^2+11x-3$$

2. Evaluate $17\frac{2}{3}-8\frac{3}{5}$ Leave your answer as a mixed number. 3

Subtract the whole numbers first

$$=9\frac{2}{3}-\frac{3}{5}$$

Convert each fraction so they have the same denominator

$$=9\frac{10}{15}-\frac{9}{15}$$

Finish the subtraction

$$=9\frac{1}{15}$$

3. Decrease 840 by 13% 3

Find 10%, 1% then 3% of 840

$$10\%\ of\ 840=84$$
$$1\%\ of\ 840=8.4$$
$$3\%\ of\ 84=3\times 8.4=25.2$$

Add 10% and 3% to get 13%

$$13\%\ of\ 84=84+25.2=109.2$$

Subtract 13% of 840

$$840-109.2=730.8$$

5. (a) Factorise $12x-18$ 1

Take out the common factor

$$=6(2x-3)$$

(b) Factorise x^2-25 2

Difference of squares

$$=(x-5)(x+5)$$

6. Express $x^2 - 6x + 11$ in the form $(x-a)^2 + b$ by completing the square. 2

First make the squared bracket, so that it matches the $-6x$ term

$$x^2 - 6x + 11$$
$$= (x-3)^2 + d$$

Now multiply out the brackets to find the value of d

$$= x^2 - 6x + 9 + d$$

So by comparing the $+11$ to the $9 + d$ we get that $d = 2$

State solution

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

7. Change the subject of the formula to k

$$\sqrt{\frac{k+7}{9}} = y$$ 3

Square both sides

$$\frac{k+7}{9} = y^2$$

Multiply both sides by 9

$$k + 7 = 9y^2$$

Subtract 7 from both sides

$$k = 9y^2 - 7$$

8. Fish food is on special offer.

Each jar on offer contains 30% more than the standard jar.

A jar on offer contains 390 grams of fish food.

How much does the standard jar contain? 3

State what we currently have

$$130\% = 390$$

Divide by 13 to get 10%

$$10\% = 30$$

Multiply by 10 to get 100%

$$100\% = 300$$

9. Simplify $\left(2x^5\right)^3$ 2

Cube both parts

$$= 2^3(x^5)^3$$

Evaluate

$$= 8 \checkmark x^{15}$$

11. Point $A(-3,7)$ and point $B(1,-3)$ are joined by a straight line

(a) Determine the gradient of this line. 2

Use the gradient formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$
$$m = \frac{-3-7}{1-(-3)}$$
$$m = \frac{-10}{4}$$
$$m = -\frac{5}{2}$$

(b) Determine the equation of the line. 2

Use $y - b = m(x - a)$ with the point $(-3,7)$ and the gradient $-\frac{5}{2}$

$$y - b = m(x - a)$$
$$y - 7 = -\frac{5}{2}(x - (-3))$$
$$y - 7 = -\frac{5}{2}(x + 3)$$
$$y - 7 = -\frac{5}{2}x - \frac{15}{2}$$
$$y = -\frac{5}{2}x - \frac{1}{2}$$

12. (a) Fully simplify $\sqrt{27} - \sqrt{12}$. 3

Rewrite each surd as a product that includes a square number

$$= \sqrt{9}\sqrt{3} - \sqrt{4}\sqrt{3}$$

Simplify

$$= 3\sqrt{3} - 2\sqrt{3}$$

Do the subtraction

$$= \sqrt{3}$$

(b) Write $\frac{15}{\sqrt{3}}$ with a rational denominator in its simplest form. 2

Multiply both sides by $\frac{\sqrt{3}}{\sqrt{3}}$

$$\frac{15}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$= \frac{15\sqrt{3}}{\sqrt{3}\sqrt{3}}$$

Simplify $\sqrt{3}\sqrt{3}$

$$= \frac{15\sqrt{3}}{3}$$

Simplify the fraction

$$= 5\sqrt{3}$$

13. At a florist shop, Steve buys 3 roses and 2 tulips for £9.40

(a) Write an equation to represent this information. 1

Define the variables (also acceptable to work in pounds not pence)

$$r = price\ of\ a\ rose\ in\ pence$$
$$t = price\ of\ a\ tulip\ in\ tulips$$

State equation (also acceptable to do in pounds not pence)

$$3r + 2t = 940$$

At the same florist shop, Natalie buys 2 roses and 4 tulips for £8.40

(b) Write an equation to represent this information. 1

State equation (using the same units as above, i.e. sticking with either pence or pounds)

$$2r + 4t = 840$$

(c) Find, algebraically, the cost of 1 rose and the cost of 1 tulip. 3

State the two equations together

$$3r + 2t = 940$$
$$2r + 4t = 840$$

Manipulate them to eliminate one variable (lots of ways to do this) for example, double the first equation

$$6r + 4t = 1880$$

Subtract the second equation from this

$$4r = 1040$$

Solve to find one variable

$$r = 260$$

Substitute to find the other variable

$$3(260) + 2t = 940$$
$$780 + 2t = 940$$
$$2t = 160$$
$$t = 80$$

State the solution

$$A\ tulip\ costs\ 80\ pence, a\ rose\ costs\ £2.60$$