Solutions and comments on Activities

Activity 1

Was your answer *elephant*?

Activity 2

Was your answer *elephant* again? Or perhaps *elk*, or *eel*? See the discussion in the text after the activity.

Activity 3

Substituting $n = 48$ into the formula

$$P = 1.24n - 0.69n$$

gives

$$\begin{aligned} P &= 1.24 \times 48 - 0.69 \times 48 \\ &= 59.52 - 33.12 \\ &= 26.4. \end{aligned}$$

So the profit is £26.40.

Activity 4

Substituting $n = 48$ into the formula

$$P = 0.55n$$

gives

$$P = 0.55 \times 48 = 26.4.$$

So the profit is £26.40.

Activity 5

(a) $\frac{2}{5}T = 24$

(b) Two-fifths of T is 24,
so one-fifth of T is $24 \div 2 = 12$,
so T is $5 \times 12 = 60$.

So there are 60 toddlers in the village.

(You can confirm that this is the right answer by checking that the equation in part (a) is correct when $T = 60$ is substituted in.)

Activity 6

Substitute $a = -2$ and $b = 5$ in each case.

(a) $$\begin{aligned} \tfrac{5}{2} + a &= \tfrac{5}{2} + (-2) \\ &= \tfrac{5}{2} - 2 \\ &= \tfrac{5}{2} - \tfrac{4}{2} \\ &= \tfrac{1}{2} \end{aligned}$$

(b) $$\begin{aligned} -a + ab &= -(-2) + (-2) \times 5 \\ &= 2 + (-10) \\ &= 2 - 10 \\ &= -8 \end{aligned}$$

(c) $$\begin{aligned} ab^2 &= (-2) \times 5^2 \\ &= -2 \times 25 \\ &= -50 \end{aligned}$$

(d) $$\begin{aligned} b + 3(b - a) &= 5 + 3(5 - (-2)) \\ &= 5 + 3 \times 7 \\ &= 5 + 21 \\ &= 26 \end{aligned}$$

Activity 7

(a) This is correct. Adding three copies of a number together is the same as multiplying it by 3.

(b) This is correct, by an index law. (The index laws were covered in Unit 3.)

(c) This is correct. Multiplying a number by 2 and then dividing by 2 results in the number you started with.

(d) This is incorrect. By an index law, $p^2 \times p^3 = p^5$.

(The statement is correct for $p = 0$ and $p = 1$, but these are the *only* values for which it is correct, so the expressions aren't equivalent.)

(e) This is correct. $2z$ is the same as $z + z$, so $z + 2z$ is the same as $z + z + z$, which is the same as $3z$.

(f) This is correct. Since $6 = 3 \times 2$, multiplying a number by 6 and then dividing by 2 results in 3 times the number you started with.

(g) This is correct. Adding the negative of a number is the same as subtracting the number. (For example, $6 + (-3)$ is the same is $6 - 3$. You met this property of numbers in Unit 1.)

(h) This is incorrect. Multiplying the number 3 by n and then dividing by n gives the result 3.

(The statement is correct for $n = 3$, but this is the *only* value for which it's correct, so the expressions aren't equivalent.)

Activity 8

(a) The expression is

$$\underbrace{+x^3}\ \underbrace{-x^2}\ \underbrace{+x}\ \underbrace{+1}\ .$$

Its terms are $+x^3$, $-x^2$, $+x$ and $+1$.

(b) The expression is

$$\underbrace{+2mn}\ \underbrace{-3r}\ .$$

Its terms are $+2mn$ and $-3r$.

(c) The expression is

$$\underbrace{-20p^2q^2}\ \underbrace{+\tfrac{1}{4}p}\ \underbrace{-18}\ \underbrace{-\tfrac{1}{3}q}\ .$$

Its terms are $-20p^2q^2$, $+\frac{1}{4}p$, -18 and $-\frac{1}{3}q$.

Activity 9

(a) The expression is

$\underbrace{-X}\ \underbrace{+20Y}\ \underbrace{-5Z}$.

Reversing the order of the terms gives

$-5Z + 20Y - X$.

(b) The expression is

$\underbrace{+2u}\ \underbrace{-3uv}$.

Reversing the order of the terms gives

$-3uv + 2u$.

(c) The expression is

$\underbrace{+4i}\ \underbrace{-j}\ \underbrace{+5}$.

Reversing the order of the terms gives

$5 - j + 4i$.

(d) The expression is

$\underbrace{+a}\ \underbrace{-b}\ \underbrace{+c}\ \underbrace{+d}$.

Reversing the order of the terms gives

$d + c - b + a$.

Activity 10

(a) The third term is $4y^2$, with coefficient 4.

(b) The second term is $-9\sqrt{q}$, with coefficient -9.

(c) The third term is x^2, with coefficient 1.

(d) The first term is $-a^2b$, with coefficient -1.

(e) The term in m^2 is $-3m^2$, with coefficient -3.

(f) The term in b is $2b$, with coefficient 2. (The term b^2 is a term in b^2, not b.)

Activity 11

(a) There is no constant term.

(b) There is a constant term, -7.

(c) There is a constant term, $5\sqrt{2}$.

(d) There is no constant term.

(e) There is a constant term, 1.

(f) There is no constant term.

Activity 12

(a) These are unlike terms: the first is a term in b, and the second is a term in b^2.

(b) These are like terms: both are terms in D.

(c) These are like terms: both are terms in z. (The first term has coefficient 1, and the second has coefficient -1.)

(d) These are unlike terms: the first is a constant term, and the second is a term in m.

Activity 13

(a) $8A + 7A = (8 + 7)A = 15A$

(b) $-5d + 8d - 2d = (-5 + 8 - 2)d = 1d = d$

($1d$ is usually written as d.)

(c) $-7z + z = -7z + 1z = (-7 + 1)z = -6z$

(d)
$$\begin{aligned} 1.4pq + 0.7pq - pq &= 1.4pq + 0.7pq - 1pq \\ &= (1.4 + 0.7 - 1)pq \\ &= 1.1pq \end{aligned}$$

(e) $\frac{1}{2}n^2 - \frac{1}{3}n^2 = \frac{3}{6}n^2 - \frac{2}{6}n^2 = \left(\frac{3}{6} - \frac{2}{6}\right)n^2 = \frac{1}{6}n^2$

(You should give the exact answer, $\frac{1}{6}n^2$, not an approximation such as $0.167n^2$.)

Activity 14

(a) These are like terms: both are terms in ab.

(b) These are like terms: both are terms in rst.

(c) These are like terms: both are terms in xy. (The second term can be written as $-3xy$.)

(d) These are like terms: both are terms in ac^2. (The first term can be written as $4ac^2$.)

(e) These are like terms: both are terms in abc. (The second term can be written as abc.)

(f) These are unlike terms. If we write the second term with the letters in alphabetical order, then it's $9cd^2$. So the first term is a term in c^2d (that is, $c \times c \times d$), and the second is a term in cd^2 (that is, $c \times d \times d$).

(g) These are unlike terms: the first is a term in A^2, and the second is a term in a^2.

(h) These are unlike terms: the first is a term in fh, and the second is a term in gh.

(i) These are like terms, as they're both constant terms.

Activity 15

(a)
$$\begin{aligned} &4A - 3B + 3C + 5A + 2B - A \\ &= 4A + 5A - A - 3B + 2B + 3C \\ &= 8A - B + 3C \end{aligned}$$

(b)
$$\begin{aligned} &-8v + 7 - 5w - 2v - 8 \\ &= -8v - 2v - 5w + 7 - 8 \\ &= -10v - 5w - 1 \end{aligned}$$

(c)
$$\begin{aligned} &20y^2 + 10xy - 10y^2 - 5y - 5xy \\ &= 20y^2 - 10y^2 + 10xy - 5xy - 5y \\ &= 10y^2 + 5xy - 5y \end{aligned}$$

(d)
$$\begin{aligned} &-4ef + 8e^2f + 10fe - 3f^2e \\ &= -4ef + 8e^2f + 10ef - 3ef^2 \\ &= -4ef + 10ef + 8e^2f - 3ef^2 \\ &= 6ef + 8e^2f - 3ef^2 \end{aligned}$$

(e) $\frac{1}{2}a + \frac{1}{3}b + 2a + \frac{1}{4}b$
$= \frac{1}{2}a + 2a + \frac{1}{3}b + \frac{1}{4}b$
$= \frac{1}{2}a + \frac{4}{2}a + \frac{4}{12}b + \frac{3}{12}b$
$= \frac{5}{2}a + \frac{7}{12}b$

Activity 16

(a) $2a^3 - 3a - 2a^3 - 3a = -6a$

(b) $2m + n - 5m + 2n + 3m = 3n$

(c) $b + 2b + 3b - 6b = 0$

Activity 17

(a) The formula is
$A = 10c + 2a.$

(b) The formula is
$T = 7c + 14a.$

(c) The formula is
$C = 10c + 2a + 7c + 14a.$

(d) Collecting like terms gives
$C = 17c + 16a.$

(e) Substituting $c = 22$ and $a = 10$ in the formula found in part (d) gives
$C = 17 \times 22 + 16 \times 10 = 374 + 160 = 534.$
The cost of the trip is £534.