Simplifying solutions

Fractions

Fractions 1

1. 1001
2. $\frac{1}{3}$
3. $\frac{11x}{12}$
4. $\frac{1}{2}$
5. $\frac{16}{7}$
6. $\frac{1}{2}+\frac{1}{2}$ and $\frac{1}{2}\div\frac{1}{2}$
7. $No, 31\frac{1}{5} > 30$
8. $\frac{8a-3b}{12}$

Fractions 2

1. $3\frac{12}{35}$
2. $\frac{28ab}{15}$
3. $\frac{5}{12}$
4. $\frac{5}{16}$
5. $13\frac{1}{5}$, $will\ fill\ 13\ glasses$
6. $\frac{1}{6}$
7. $\frac{1}{2}\div\frac{1}{4}=2$
8. $\frac{ac+b^2}{bc}$

Circles *All the shaded areas are equal to* $\frac{1}{4}\pi$

Peaches *On Day 6 the monkey keeps* $\frac{1}{4}$ *of 8 (2 peaches) gives 6 away and eats 1 leaving 1 at the end. Order:* $\frac{11}{15}, \frac{5}{6}, \frac{3}{4}, \frac{1}{2}, \frac{3}{5}, \frac{1}{4}$

Petrol Station Solution $\mathbf{18\frac{1}{3}}$ *litres*

Integers solution $x = 92$

Fractions of 1000 Solution $\frac{1}{10}$ x 1000 = 100

Unit Fractions Solutions

$\frac{1}{2}=\frac{1}{3}+\frac{1}{6}$ $\frac{1}{2}=\frac{1}{10}+\frac{1}{20}$ $\frac{1}{3}=\frac{1}{4}+\frac{1}{12}$ $\frac{1}{3}=\frac{1}{7}+\frac{1}{21}$ $\frac{1}{4}=\frac{1}{5}+\frac{1}{20}$

In general this can be written as: $$\frac{1}{n}=\frac{1}{n+1}+\frac{1}{n(n+1)}$$

Some unit fractions can be made in more than one way

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Here are some examples for $\frac{1}{6}$ and $\frac{1}{8}$

$\frac{1}{6}=\frac{1}{9}+\frac{1}{18}$ $\frac{1}{6}=\frac{1}{10}+\frac{1}{15}$ $\frac{1}{6}=\frac{1}{12}+\frac{1}{12}$

$\frac{1}{8}=\frac{1}{9}+\frac{1}{72}$ $\frac{1}{8}=\frac{1}{10}+\frac{1}{40}$ $\frac{1}{8}=\frac{1}{12}+\frac{1}{24}$

Unit fractions with denominators which are prime can only be written one way as the sum of two distinct unit fractions so, you can do $\frac{1}{7}=\frac{1}{8}+\frac{1}{56}$ but you cannot find another one for $\frac{1}{7}$

Indices

Indices 1

1. x^{11}
2. 9^7
3. 2^{15}
4. $\frac{1}{4}$
5. 4
6. $\frac{1}{16}$
7. $\frac{1}{64}$
8. $\frac{5}{2}$

Indices 2

1. t^9
2. 8^5
3. 3^8
4. $\frac{1}{5}$
5. 2
6. 1
7. $\frac{1}{81}$
8. $\frac{9}{4}$

Maze

$2^6\times2^3$	$3^2\times2^3$	$(\sqrt{16})^2$	$(2^3)^3$	$8^3\div8$	$4^4\times4^{-3}$	$(\sqrt[3]{8})^4$	8×4^2
$\sqrt{8}^3$	$(2^3)^2$	$8^7\times8^{-5}$	4^3	$2^{-2}\times2^7$	64^0	$2^5\times2^3$	$4^7\div2^3$
$(\sqrt{64})^3$	8^2	$2^2\times2^3$	$2^3\times2^3$	$(2^3)^3$	$(\sqrt[3]{8})^6$	$4^6\times4^{-3}$	$2^2\times4^2$
2^6	$(\sqrt{64})^2$	$4^6\times4^{-2}$	$(\sqrt{16})^3$	$(2^2)^4$	$8^3\div2^3$	$2^{-3}\times2^7$	$(2^2)^4$
3^5	$2^6\times2^1$	8^3	$4^5\div2^4$	$(-4)^{-3}$	$(2^2)^3$	$(\sqrt{8})^3$	$4^6\div2^6$
$4^3\times4^{-3}$	$(2^5)^1$	$(\sqrt[3]{64})^2$	$2^3\times8$	$2^{-1}\times2^7$	$(\frac{1}{4})^{-3}$	16^2	64

Simplifying solutions

Matching Pairs

A
$\left(\frac{9}{16}\right)^{\frac{1}{2}}$
$(4)^{\frac{3}{2}}$
$(-5)^{-2}$
$(16)^{-\frac{3}{2}}$
$(2)^{-3}$
$(64)^{-\frac{1}{3}}$
$\left(\frac{4}{9}\right)^{-\frac{1}{2}}$
4^{-2}

B
$\frac{3}{4}$
8
$\frac{1}{25}$
$\frac{1}{64}$
$\frac{1}{8}$
$\frac{1}{4}$
$\frac{3}{2}$
$\frac{1}{16}$

Where does it belong the order should be as follows $x, x^3, x^4, x^2, x^0, -\boldsymbol{x}^{-1}$

Surds

Surds 1

1. $8\sqrt{a}$
2. $2\sqrt{3}$
3. 48
4. $5\sqrt{3}$
5. 3
6. $\frac{4\sqrt{3}}{3}$
7. $\sqrt{66}\ cm$
8. $4\sqrt{5}cm$

Simplifying solutions

Surds 2

1. $4\sqrt{d}$
2. $8\sqrt{3b}$
3. 80
4. $5\sqrt{3}$
5. 1
6. $\frac{2\sqrt{10}}{5}$
7. $\sqrt{2}$
8. $30\ cm^2$

Another Brick in the Wall

$31\sqrt{3} + 18\sqrt{5}$

$11\sqrt{3} + 15\sqrt{5}$ | $20\sqrt{3} + 3\sqrt{5}$

$9\sqrt{3} + 7\sqrt{5}$ | $2\sqrt{3} + 8\sqrt{5}$ | $18\sqrt{3} - 5\sqrt{5}$

$7\sqrt{3}$ | $2\sqrt{3} + 7\sqrt{5}$ | $\sqrt{5}$ | $-6\sqrt{5} + 18\sqrt{3}$

$\sqrt{75}$ | $2\sqrt{3}$ | $\sqrt{245}$ | $-\sqrt{180}$ | $2\sqrt{243}$

True or False

1. $False$	2. $True\ when\ a \times b = c$ $otherwise\ False$	3. $True$	4. $True$
5. $True$	6. $True$	7. $True$	8. $False$

Simplifying solutions

The Wheel of Theodorus

Can you see how the diagram is constructed?

The hypotenuse of the first triangle then becomes a side on the next triangle.

Find the length of the hypotenuse for the first few triangles.

Using Pythagoras' theorem $a^2 + b^2 = c^2$ we get $1^2 + 1^2 = 2$ so $c^2 = 2$.
Then the hypotenuse of the smallest triangle is $\sqrt{2}$
This means the second triangle has sides with length 1 and $\sqrt{2}$
Using Pythagoras' theorem again gives us the hypotenuse of $\sqrt{3}$ Continuing, the next hypotenuse would be $\sqrt{4}$ (which equals 2), then $\sqrt{5}$ and so on.

What do you notice?

The lengths of the first few hypotenuses are $2, \sqrt{3}, \sqrt{4}, \sqrt{5}$ ...
You will have noticed a pattern in these lengths - so do we really need to keep using Pythagoras' theorem to find the hypotenuse of each of the triangles?

Which of the triangles would have a side length of 3

We know that $\sqrt{9} = 3$ and from the patterns described above we can see there would be a side of length 3 in the 8th (purple) and 9th (orange) triangles.