YEAR 6
Efficient Methods

Worked examples for Key Stage 2

ARITHMETIC

Contents

① 5682 + 379

```
  1 1 1
  5 6 8 2
+   3 7 9
-------
  6 0 6 1
```

← be sure to line up by place value

↑ your answer does not need commas

② 6807 - 394

```
    7 10
  6 8 Ø 7
-   3 9 4
-------
  6 4 1 3
```

only exchange if needed

③ 4000 - 3947

```
  3  9  9
  4 10 10 10
  4  Ø  Ø  Ø
- 3  9  4  7
-----------
  0  0  5  3
```

← make sure you don't exchange here

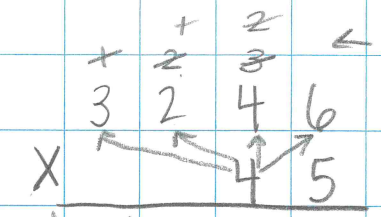
Your answer is 53, not 0053.

④

```
    5 2
    6 8 4
x       6
---------
4 1 0 4
```

← don't forget to add these on.

⑤ ← cross out after you've used these



1 1 6 1 2 3 0 ← this row, times each by 5

+ 1 2 9 8 4 0 ← this row, times each by 4. don't forget the place holder

add 1 4 6 0 7 0

⑥ ×100 ×10

3 4 0 0 × 2 0 = 6 8 0 0 0

3 4 × 2 = 6 8

Mental

then 100x bigger and 10x bigger

6 0 0 0 × 4 0 0 = 2 4 0 0 0 0 0

6 × 4 = 2 4

then 1000x bigger then 100x bigger

⑦ 3600 ÷ 12

3600 = 300

12

↖ 36÷12

Mental

4000 ÷ 80

4000 = 50 ← cancel pairs of zeroes.

80

↘ 40÷8

250 ÷ 50

250 = 5

50

↖ 25÷5

(8) Mental

When ÷ or × by 10, 100 or 1000 use the grids and "jump"

smaller ÷ → ← × larger

45 ÷ 10 = 4.5 ÷10 (one jump)

÷100 (2 jumps)

÷1000 (3 jumps)

45. ← 4.5 ← Whole numbers have decimals and the end.

8.3 × 100 = 830

8.3

83.

830.

(9)

7248 ÷ 5 = 1449 r3

1449 r3 ← on SATs Test 1, Leave the remainder

5 ⟌ 7²2²448

Check by doing the inverse:

²²⁴
1449
× 5
7245
+ 3
7248 ← this is the same.

then add the 3 remainder

(Short division)

(10) 8022 ÷ 21

List 1st, 2nd, 4th, 8th multiple of 21 to start

$$\begin{array}{r} 382 \\ 21\overline{)8017242} \end{array}$$

(21 goes into 80 3 times)
(80 − 63 = 17)
↑ remainder

(21 goes into 172 6 times)
(172 − 168 = 4)
↑ remainder

(21 goes into 42 2 times)
(42 − 42 = 0)

		I needed ↓ this
①	21	21
②	42	× 3
④	84	63 ③
⑧	168	

21 × 7 = 147 ⑦

On SATs Paper 1, these <u>usually</u> don't have remainders.

Check by doing 21 × 382.

$$\begin{array}{r} {\scriptstyle 1} \\ 382 \\ \times\ 21 \\ \hline 3820 \\ 7640 \\ \hline 8022 \end{array}$$ ✓

(Short division)

(10) 8022 ÷ 21

List 1st, 2nd, 4th, 8th multiple of 21 to start

```
      382
  21 | 8017242
```

(21 goes into 80 3 times)
(80 − 63 = 17)
↑ remainder

(21 goes into 172 6 times)
(172 − 168 = 4)
↑ remainder

(21 goes into 42 2 times)
(42 − 42 = 0)

① 21
② 42
④ 84
⑧ 168

I needed this

```
  21
x  3
----
  63   ③
```

```
  21
x  7
----
 147   ⑦
```

On SATs Paper 1, there usually don't have remainders.

Check by doing 21 × 382.

```
   1
  382
x  21
-----
 3820
 7640
-----
 8022 ✓
```

(11) 362.4 + 8.99

$$\begin{array}{r} 362.40 \\ +\ \ 8.99 \\ \hline 371.39 \end{array}$$

← add place holders

← ensure you line up by place value

Don't forget ↗ in your answer ↑

Your decimals should be in a line

(12) 382.6 − 1.43

↑ must be on top

You must have place holders.

$$\begin{array}{r} 382.\overset{5}{\cancel{6}}\overset{16}{\cancel{0}} \\ -\ \ 1.43 \\ \hline 381.17 \end{array}$$

← Exchange

← Line up by place value

35 − 0.82

$$\begin{array}{r} 35.\overset{4}{\cancel{0}}\overset{9}{\cancel{0}}\overset{10}{\cancel{0}} \\ -\ \ 0.82 \\ \hline 34.18 \end{array}$$

← Whole numbers have decimals at the end. Remember to add place holders and exchange.

Check with addition

$$\begin{array}{r} {}^{1}34.{}^{1}{}^{1}8 \\ +\ \ 0.82 \\ \hline 35.00 \end{array}$$ ✓

(13) 5032 - ? = 479

5032
?	479

← 5032 - 479

$$\begin{array}{r} {\scriptstyle 4}\,{\scriptstyle 9}\quad {\scriptstyle 12}\,{\scriptstyle 12} \\ 5\,\not{0}\,\not{3}\,\not{2} \\ -\quad 4\,7\,9 \\ \hline 4\,5\,5\,3 \end{array}$$

? = 4553

Check:

$$\begin{array}{r} {\scriptstyle 4}\,{\scriptstyle 9}\quad {\scriptstyle 12}\,{\scriptstyle 12} \\ 5\,\not{0}\,\not{3}\,\not{2} \\ -\,4\,5\,5\,3 \\ \hline 4\,7\,9 \end{array}$$ ✓

? + 824 = 1063

1063
?	824

1063 - 824

$$\begin{array}{r} {\scriptstyle 0}\,{\scriptstyle 10}\,{\scriptstyle 5}\,{\scriptstyle 13} \\ 1\,\not{0}\,\not{6}\,\not{3} \\ -\quad 8\,2\,4 \\ \hline 2\,3\,9 \end{array}$$

? = 239

Check:

$$\begin{array}{r} {\scriptstyle 1} \\ 2\,3\,9 \\ +\,8\,2\,4 \\ \hline 1\,0\,6\,3 \end{array}$$ ✓

(14) Mental

$0.4 \times 5 = 2.0$ (1 dp, 1 dp, 1 dp) which is 2

4×5 then 1 dp ($\div 10$)

20

$3.6 \times 4 = 14.4$ (1 dp, 1 dp, 1 dp)

36×4 then 1 dp ($\div 10$)

144

$0.08 \times 7 = 0.52$ (1, 2 dp, 1, 2 dp)

8×7 then 2 dp ($\div 100$)

56

2 1

$$\begin{array}{r} {}^{2}3\,6 \\ \times \quad 4 \\ \hline 14\,4 \end{array}$$

(15)

$$\begin{array}{r} {}^{3}4.{}^{1}6\,3 \\ \times \quad 5 \\ \hline 23.15 \end{array}$$

Do not line up decimals. It stays in the same place when only one number has a decimal

$$\begin{array}{r} {}^{1}8.2 \\ \times \quad 5 \\ \hline 41.0 \end{array}$$

which is 41.

(16) $0.8 \times 0.9 = 0.72$ (1 dp, 2 dp)

($\div 10$) ($\div 10$)

$8 \times 9 = 72$

then 2 dp or $\div 10$ then $\div 10$

* These usually do not come up on the test.

(17) $38.6 \div 2 = 19.3$

$$
\begin{array}{r|l}
2 & 3^{1}8.^{\circ}6 \\
\hline
 & 19.3
\end{array}
$$

The decimal goes straight up

$35.6 \div 4 = 8.15$

$$
\begin{array}{r|l}
4 & 3^{3}5.6^{2}0 \\
\hline
 & 08.15
\end{array}
$$

Add zeroes and continue dividing. Remember that you can't have a remainder with a decimal.

(18) ( )

i^2

$X \div$ (whichever is first)

$+ -$ (whichever is first)

$3^2 = 3 \times 3 = 9$

$4^3 = 4 \times 4 \times 4 = 64$

$6 - 3 \div 1 \times 2 + 4^2 - (2 + 1)$

$6 - 3 \div 1 \times 2 + \cancel{4^2} - 3$

$6 - 3 \div 1 \times 2 + 16 - 3$

$6 - \cancel{3 \div 1} \times 2 + 16 - 3$

$6 - \cancel{3 \times 2} + 16 - 3$

$\cancel{6 - 6} + 16 - 3$

$\cancel{0 + 16} - 3$

$16 - 3$

13

(19) $3\frac{1}{5}$ as an improper fraction:

(+ → 3 ↷ 1/5, × ↷)

$5 \times 3 + 1$ (numerator)

5 (denominator)

$3\frac{1}{5} = \frac{16}{5}$

$\frac{9}{5}$ as a mixed number

↑ how many fives into 9? 1 ↑ whole number

4 left over (numerator)

5 (denominator)

$\frac{9}{5} = 1\frac{4}{5}$

(20) $\frac{3}{5}$ × ÷ of $40 = 24$

$40 \div 5 = 8$ $(1/5)$

$8 \times 3 = 24$ $(3/5)$ ↑ answer

$\frac{4}{7}$ × ↓ of $28 = 16$

$28 \div 7 = 4$ $(\frac{1}{7})$

$4 \times 4 = 16$ $(\frac{4}{7})$ ← answer)

(21) Simplifying fractions:

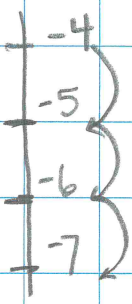
$\frac{7}{21}$ What goes into 7 and 21 evenly?

$\frac{7 \div 7}{21 \div 7} = \frac{1}{3}$ ← simplified

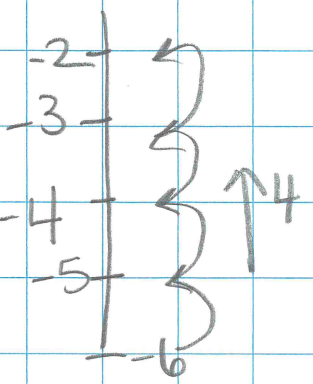
$\frac{16 \div 2}{34 \div 2} = \frac{8}{17}$

$\frac{25 \div 5}{100 \div 5} = \frac{5 \div 5}{20 \div 5} = \frac{1}{4}$ ← simplified

(22) $-4 - 3 = -7$



$-6 + 4 = -2$



$-2 + -5 = -7$

2 negatives add
5 negatives is
7 negatives

(23) To write a decimal as a percentage, write as a fraction first.

$$0.4 = \frac{4}{10} \overset{\times 10}{=} \frac{40}{100} = 40\%$$

$\times 10$ on the denominator; $\uparrow$ for a %

$$0.23 = \frac{23}{100} = 23\%$$

$$\frac{5}{20} \overset{\times 4}{=} \frac{20}{100} = 0.20 = 20\%$$

$\times 4$ on the denominator

(powers of 10)

Decimals have denominators of 10, 100 or 1000. Percentages have denominator of 100.

(24) Common equivalences.

$\frac{1}{4} = 0.25 = 25\%$ $\quad$ $\frac{1}{5} = \frac{2}{10} = 0.2 = 20\%$

$\frac{1}{2} = 0.5 = 50\%$

$\frac{3}{4} = 0.75 = 75\%$

(25) 20% x 350 is the same as 20% of 350

20% of 350 = 70

100% → 350 (÷10)

÷10 → 10% → 35

×2 → 20% → 70 (×2)

↑ answer

Find 10% by dividing by 10

350.

35.0

OR

10% + 10% = 20%

×10 ↙

35 + 35 = 70

43% of 800 = 344

100% → 800

÷100 ÷10 → 10% → 80 ÷10

÷10 → 1% → 8 ÷100 ÷10

10% + 10% + 10% + 10% = 40%

80 + 80 + 80 + 80 = 320

1% + 1% + 1% = 3%

8 + 8 + 8 = 24

40% + 3% = 43%

320 + 24 = 344

Other %

Find 5% by halving 10%

Find 50% by halving the whole

Find 25% by finding a quarter of the whole

(26) To multiply fractions, you don't need common denominators:

$\frac{3}{5} \times \frac{2}{3} = \frac{6}{15}$ multiply straight across

$\frac{6}{15} \div 3 = \frac{2}{5}$ (simplified)

(27) When x by a whole, only multiply the tops.

$\frac{2}{3} \times 2 = \frac{6}{3} = 2$

$1\frac{4}{5} \times 2 = \frac{8}{5} = 1\frac{3}{5}$

(28) Partition when multiplying by a mixed number.

$4\frac{2}{3} \times 7 = 32\frac{2}{3}$

$4 \times 7 = 28$

$\frac{2}{3} \times 7 = \frac{14}{3} = 4\frac{2}{3}$ (only x the top)

*can't leave it like this

$28 + 4\frac{2}{3} = 32\frac{2}{3}$

28) Option 2 for multiplying by a mixed number

$4\frac{2}{3} \times 7$

↓

Change to an improper fraction

↙ multiply numerators

$$\frac{14}{3} \times 7 = \frac{98}{3} = 32\frac{2}{3}$$

↑ Change back to a mixed number

Simplify if needed.

(29) For ÷, you do not need common denominators.

Change ÷ to ×

$\frac{3}{5} \div 2$

↙ put "one over" and "×"

$\frac{3}{5} \times \frac{1}{2} = \frac{3}{10}$

(This is the same as $\frac{1}{2}$ of $\frac{3}{5}$)

(30) Find common denominators when adding and subtracting

$\frac{4}{5} + \frac{2}{3} = 1\frac{7}{15}$

$\frac{4}{5} = \frac{8}{10} = \frac{12}{15}$

$\frac{2}{3} = \frac{4}{6} = \frac{6}{9} = \frac{8}{12} = \frac{10}{15}$

$\frac{12}{15} + \frac{10}{15} = \frac{22}{15} = 1\frac{7}{15}$

$\frac{2}{3} - \frac{1}{4} = \frac{5}{12}$

$\frac{2}{3} = \frac{4}{6} = \frac{6}{9} = \frac{8}{12}$

$\frac{1}{4} = \frac{2}{8} = \frac{3}{12}$

$\frac{8}{12} - \frac{3}{12} = \frac{5}{12}$

Be sure not to swap the order.

(31) When adding mixed numbers, remember to make sure you convert where needed.

EX: $3\frac{8}{3}$ can't be the answer because $\frac{8}{3}$ is improper

$3\frac{8}{3}$

$3 \uparrow \quad \frac{8}{3} \nwarrow$

$3 + 2\frac{2}{3} = 6\frac{2}{3}$

$4\frac{4}{5} + 3\frac{3}{10} = 8\frac{1}{10}$

$4\frac{4}{5} = 4\frac{8}{10}$

$3\frac{3}{10}$

$4\frac{8}{10} + 3\frac{3}{10} = 7\frac{11}{10}$

$7\frac{11}{10}$

$\uparrow$

$7 + 1\frac{1}{10} = 8\frac{1}{10}$

(32) Subtracting mixed numbers when exchanging is not needed:

$3\frac{2}{3} - 1\frac{1}{6}$

$3\frac{2}{3} = 3\frac{4}{6}$ You cannot switch the fraction and whole number

$1\frac{1}{6}$

$3\frac{4}{6} - 1\frac{1}{6} = 2\frac{3}{6} = 2\frac{1}{2}$ (simplified)

Don't swap the order

(33) Subtracting mixed numbers when exchanging is needed:

$4\frac{1}{4} - 2\frac{3}{4}$ (denominators are already the same)

★ $4\frac{1}{4} - 2\frac{3}{4} \neq 2\frac{2}{4}$ ★ $\neq$ is not

$3\frac{4}{4}\frac{1}{4} - 2\frac{3}{4}$

$3\frac{5}{4} - 2\frac{3}{4} = 1\frac{2}{4} = 1\frac{1}{2}$ (simplified)