Section 6: Decimals

In this section you will:
- multiply simple decimals in your head
- work with tenths, hundredths and thousandths
- order decimals

WORKING TOGETHER

T6.1: Multiplying decimals in your head

EXAMPLE   Evaluate   3 x 0.4   and   3 x 0.04

"Evaluate" means "find the value of".

Idea $3 \times 4 = 12$ so $3 \times 0.4 = 1.2$ and $3 \times 0.04 = 0.12$

Evaluate:

1) 4 x 0.2	2) 5 x 0.5	3) 4 x 0.02	4) 0.12 x 2	5) 0.7 x 3
6) 5 x 1.1	7) 0.21 x 3	8) 0.03 x 5	9) 0.32 x 3	10) 5 x 0.51

T6.2: Multiplying a decimals by a decimal

A useful shortcut

$$0.2 \quad x \quad 0.3 \quad = \quad 0.06$$

total number of decimal places before multiplication = total number of decimal places after multiplication

$2 \times 3 = 6$
$\div 10 \quad \div 10 \quad \div 100$
$0.2 \times 0.3 = 0.06$

EXAMPLE   0.11 x 0.04 = ?

Fission $11 \times 4 = 44$ There are 4 decimal places in the question.

so, 0.11 x 0.04 = $\boxed{0.0044}$

EXAMPLE   0.035 x 0.02 = ?

Chyps $35 \times 2 = 70$ There are 5 decimal places in the question.

so, 0.035 x 0.02 = $\boxed{0.00070}$

Evaluate:

1) 0.01 x 0.2	2) 0.03 x 0.001	3) 0.1 x 0.1	4) 0.3 x 0.6
5) 0.8 x 0.002	6) 1.2 x 0.03	7) 4.3 x 0.02	8) 0.002 x 1.4

T6.3: True or false ?

0.8 = 8 tenths   &   0.80 = 8 tenths and 0 hundredths   so 0.80 = 0.8

True (T) or false (F) ? :

1. 0.3 = 0.30	2. 0.7 = 0.07	3. 2.5 = 2.50	4. 63 = 63.0
5. 0.5 = .5	6. 0.85 = 0.805	7. 0.04 = .04	8. 0.79 = 0.790

Idea: Topic 1: Number Techniques   *Section 6*   *page 21*

T6.4: Ordering decimals

EXAMPLE   Which is the bigger   2.437 or 2.473 ?

both numbers have 2 units and 4 tenths

2 . 4 3 7
2 . 4 7 3

7 hundredths is more than 3 hundredths, so the bottom number is bigger

Compare corresponding pairs of digits (tens and tens, units and units, tenths and tenths …), starting with the digits on the left.

2.473 is bigger.

Which is the bigger number ?

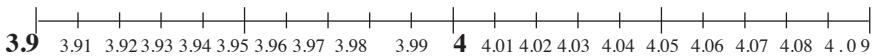1) 4.6   4.9   2) 3.75   3.78   3) 2.953   2.778

4) 3.61   3.59   5) 7.77   7.39   6) 0.823   0.832

Find the smallest number in each set:

7) 2.357 2.573 2.753   8) 6.001   6.011   6.013

9) 1.825 1.794 1.813   10) 0.0245   0.0254   0.0237   *Driller*

T6.5: Decimal tenths and hundredths

3.9 3.91 3.92 3.93 3.94 3.95 3.96 3.97 3.98   3.99 **4** 4.01 4.02 4.03 4.04 4.05 4.06 4.07 4.08 4 . 0 9

Find the next FOUR terms in each sequence:

1) 3.9   3.93   3.96   3.99   …   2) 3.94   3.96   3.98   4   …

3) 5.35   5.39   5.43   5.47   …   4) 6.45   6.47   6.49   6.51   …

5) 4   3.98   3.96   3.94   …   6) 7.25   7.23   7.21   7.19   …

Place in order with the smallest first:
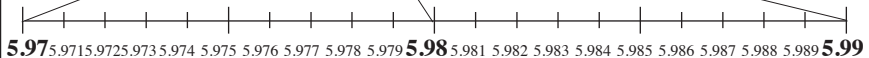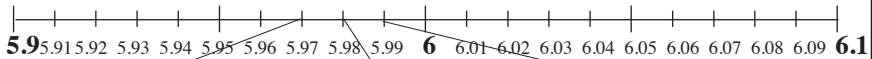
7) 2.47   2.43   2.41   2.49   8) 3.26   3.28   3.21   3.25

9) 5.21   5.35   5.71   5.19   10) 3.9   3.93   3.87   3.89

Star Challenge 14   **ON YOUR OWN**   *All correct = 1 star*

Decimal tenths, hundredths and thousandths

5.9 5.91 5.92 5.93 5.94 5.95 5.96 5.97 5.98 5.99 **6** 6.01 6.02 6.03 6.04 6.05 6.06 6.07 6.08 6.09 **6.1**

5.97 5.971 5.972 5.973 5.974 5.975 5.976 5.977 5.978 5.979 **5.98** 5.981 5.982 5.983 5.984 5.985 5.986 5.987 5.988 5.989 **5.99**

Find the next FOUR terms in each sequence:

1) 5.97   5.972 5.974 …   2) 5.973 5.977 5.981 … 3) 5.984   5.981   5.978 …

4) 4.353 4.355 4.357 …   5) 6.015 6.019 6.023 … 6) 3.213   3.218   3.223 …

• *Your teacher has the answers to these*.

Star Challenge 15

Multiplying decimals

Evaluate:

1) 5 x 0.3   2) 0.6 x 4   3) 2.1 x 3   4) 4.5 x 2

5) 0.1 x 8   6) 1.5 x 3   7) 0.1 x 0.3   8) 0.02 x 0.4

9) 0.2 x 0.02   10) 1.4 x 0.2   11) 3.1 x 0.02   12) 0.42 x 0.2

13) 1.23 x 0.2   14) 2.45 x 0.02   15) 0.61 x 0.3   16) 2.1 x 4

• *Your teacher has the answers to these.*

Star Challenge 16·16

Ordering challenge

Which is the bigger number ?

1) 7.3   6.9   2) 1.4 1.7   3) 3.51 3.15

4) 6.28 6.82   5) 9.25   9.75   6) 3.297 3.287

Find the smallest number in each set:

7)   3.68   8.63   6.83   8) 7.52   5.72   2.75   2.57

Place in order with the largest first:

9) 5.976   5.974   5.971   10) 5.987 5.985   5.98

11) 3.273   3.373   3.173   12) 6.255 6.235   6.215

Put in ascending order:

13) 7.896 m   7.986 m   9.786 m   8.796 m

14) 0.01   0.001   0.12   0.0012

Crumbl

• *Your teacher has the answers to these.*

Star Challenge 17·17

Related decimals

Find the next THREE numbers in each sequence:

1)   3.5   4.5   5.5   …   2)   6.21   6.23   6.25   …

3)   7.13   7.16   7.19   …   4)   5.25   5.29   5.33   …

5)   3.211   3.213   3.215   …   6)   6.333   6.337   6.341   …

Write the number which is halfway between each pair of numbers:

7)   3.94   …   3.96   8)   4.02   …   4.08

9)   3.75   …   3.77   10) 4   …   4.1

11) 3.97   …   4.01   12) 5.55   …   5.61

13) 5.982   …   5.988   14) 6.152   …   6.156

Kooldood   15) 7.385   …   7.389   16) 2.961   …   2.971

Put > or < in the gap to make a correct statement:

17) 3.93 … 3.97   18) 4.08 … 3.99

19) 6.55 … 6.45   20) 2.645 … 2.654

Hint: 2 < 3
and   7 > 5
Idea

• *Your teacher has the answers to these.*

Section 7: Rounding decimals

In this section you will round decimals to the nearest whole number and to 1 or 2 decimal places.

T7.1: Rounding calculator values

The instructions on the exam paper said
" Give each answer to the nearest whole number."

1. [73] [÷] [13] [=] [5.615386]

Spottee says that the answer is 5 to the nearest whole number.

Spottee

Ruff says that the answer is 6 to the nearest whole number

Ruff

Who is right ?   Which figure do you look at to decide whether the answer stays as 5 or is rounded up to 6 ?

2. [120] [÷] [13] [=] [9.230769]
Up ? or Down ?

What is 120 ÷ 13 to the nearest whole number ?

3. [75] [÷] [6] [=] [12.5]
Fission
Up ? or Down ?

Chyps   What is 75 ÷ 6 to the nearest whole number ?

$\sqrt{20}$ to 1 decimal place ?   [√] [20] [=] [4.472135955 …]

4 . 4 7 ……

4.47… lies between 4.4 and 4.5

Big Edd

7 is more than 5, so we round <u>up</u>

So, $\sqrt{20}$ = 4.5 to 1 decimal place (to 1 d.p.)

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4. *Evaluate, using a calculator. Write each value to the nearest whole number.*

    (a) 43 ÷ 3   (b) $\sqrt{14}$ (c) $\sqrt{57}$ + 5   (d) 347 ÷ 13
    (e) 9.6 x 4.7   (f) $\sqrt{79}$ (g) $\sqrt{18}$ x 3   (h) 2321 ÷ 17

5. *Evaluate, using a calculator. Write each value to one decimal place.*

    (a) 37.1 x 4.37   (b) $\sqrt{347}$ (c) 773 ÷ 17   (d) 131.4 x 2.39
    (e) 14.1 ÷ 2.6   (f) $\sqrt{596}$ (g) $\sqrt{47}$ x 2.9   (h) 41.6 x 13 ÷ 5.7

Idea: Topic 1: Number Techniques   *Section 7*   *page 24*

T7.2: Problems with answers that need rounding

You will probably have met some/all of these types of calculations before. However, it does not matter if you cannot remember how to do any of them. Each calculation will be given to you. [You will learn/be reminded how to do calculations like these later in the course.]

Your job is to round the answer sensibly.
Remember, unless you are given different instructions :
- if the answer is a number of people, it must be a whole number
- if the answer is money, it should be rounded to the nearest penny

EXAMPLE The price of a blouse was £44.99. This price was increased by 10%.
Work out the new price using the calculation given below.
Give the answer in a sensible rounded form.

New price = £44.99 x 1.1 = £49.489 ≈ £49.49 (to the nearest penny)

Work out the answer to each calculation, using a calculator.
Give the answer in a sensible rounded form.

1. The price of a pair of shoes was £37.75. The price was increased by 5%.
    New price = £37.75 x 1.05 = £…………

2. The price of a pair of shoes was £55.95. In the sale, the price was decreased by 5%.
    New price = £55.95 x 0.95 = £…………

3. 15,468 people were at a football match. It is estimated that 14% of the crowd were women.
    Estimated number of women = 15,468 x 0.14 = …………

4. Solly's wage of £165.42 per week is to be increased by 3%.
    New wage = 1.03 x £165.42 = £……………

5. There are 768 students at Whynot School.
    (a) On the last day of term, 84% of the students were in school.
        Number of students in school = 0.84 x 768 = …………… students
    (b) On the first day of term, 751 of the 768 students were in school.
        Percentage present = 751 ÷ 768 x 100 = …………… (to the nearest percent)

ON YOUR OWN

T7.3: Rounding practice

Evaluate each expression with a calculator.
Q1-6 : write down each value to the nearest whole number.

Driller

1. $147 \div 34$	2. $634 \div 24$	3. $37.87 + 4.3$
4. $\sqrt{59.876}$	5. 35.1×2.7	6. $\sqrt{33}$

Q7-12 : write down each value to one decimal place.

7. $367 \div 12$	8. $678 \div 13$	9. 462×0.48
10. 57.93×4.7	11. 0.34×2.7	12. 876×0.07

Star Challenge ⭐18⭐

Rounding challenge

Write down each value to the nearest whole number.

1. $506 \div 3.9$
2. $\sqrt{368}$
3. $53.76 \div 6.2$
4. $55.44 \div 13.2$
5. $\sqrt{45.78}$
6. $196 \div 27$

Write down each value to 1 d.p. (1 decimal place)

7. $67.9 \div 12.4$
8. 14.84×45.6
9. 56.43×0.65
10. $36.89 \div 6.7$
11. $673 \div 57$
12. $32.005 \div 1.97$

• Your teacher has the answers to these.

Star Challenge ⭐19⭐

Sensible answers

Work out the answer to each calculation, using a calculator.
Give the answer in a sensible rounded form.

1. The price of a pair of jeans was £55.95. The price was then increased by 4%.
   New price = 1.04 x £55.95 = £…………

2. The number of people who paid to get into a Rock Festival was 31,743.
   It is also estimated that 3% of this number got in without paying.
   Estimated number of non-payers $\approx$ 0.03 x 31743 = ……………people

   Headbanger

3. The price of a computer was £239.75. In a sale, the price was reduced by 15%.
   Sale price = 0.85 x £239.75 = £……………

4. The number of students in Y10 is 187. On the worst day of a 'flu' epidemic, 67% were absent.
   Number absent = 0.67 x 187 = ……………

5. A DVD player is priced at £89.50. In a sale, the price is reduced by 12.5%
   Sale price = 0.875 x £89.50 = £……………

• Your teacher has the answers to these.

Star Challenge ⭐20⭐

Chain calculation

Work out 35.6 x 1.2
Write down the answer to nearest whole number
Multiply the number you wrote down by 2.3
Write down the answer to nearest whole number
Multiply the number you wrote down by 3.4
Write down the answer to nearest whole number
Multiply the number you wrote down by 4.5
Write down the answer.

Letmewin

Inaspin

• Your teacher has the answers to this.

Idea: Topic 1: Number Techniques   *Section 7*   *page 26*

ANSWERS To Y10 Idea
Topic 1: Number Techniques

Section 6: Decimals   p 21

T6.1: Multiplying decimals in your head

1) 0.8   2) 2.5 3) 0.08   4) 0.24   5) 2.1
6) 5.5   7) 0.63   8) 0.15   9) 0.96   10) 2.55

T6.2: Multiplying a decimal by a decimal

1) 0.002   2) 0.00003   3) 0.01   4) 0.18
5) 0.0016   6) 0.036   7) 0.086   8) 0.0028

T6.3: True or false

1. T   2. F   3. T   4. T   5. T
6. F   7. T   8. T

T6.4: Ordering decimals

1) 4.9 2) 3.78   3) 2.953   4) 3.61   5) 7.77
6) 0.832   7) 2.357   8) 6.001   9) 1.794 10) 0.0237

T6.5: Decimal tenths and hundredths

1. 4.02   4.05   4.08   4.11   2. 4.02 4.04   4.06   4.08
3. 5.51   5.55   5.59   5.63   4. 6.53   6.55   6.57 6.59
5. 3.92   3.9 3.88   3.86   6. 7.17   7.15   7.13   7.11
7. 2.41, 2.43, 2.47, 2.49   8. 3.21, 3.25, 3.26, 3.28
9. 5.19, 5.21, 5.35, 5.71   10. 3.87, 3.89, 3.9, 3,93

Section 7: Rounding decimals   p 24

T7.1: Rounding calculator values

1. Ruff is right.   [Look at the 6 or look at the first decimal place.]
  2. 9   3. 13
4. (a) 14   (b) 4   (c) 13 (d) 27 (e) 45 (f) 9 (g) 13 (h) 137
5 (a) 162.1 (b) 18.6 (c) 45.5 (d) 314.0 (e) 5.4 (f) 24.4
  (g) 19.9 (h) 94.9

T7.2: Problems with answers that need rounding

1. £39.64   2. £53.15   3. 2 166
4. £170.38 5. 645   6. 98%

T7.3: Rounding practice

1) 4   2) 26 3) 42 4) 8   5) 95 6) 6
7) 30.6   8) 52.2   9) 221.8   10) 272.3   11) 0.9 12) 61.3

Star Challenge 11

Working with brackets

1. 25   2. 13   3. 26   4. 26   5. 102
6. 92   7. 2   8. 7   9. 6

Star Challenge 12

Where do the brackets go ?

1. $7 \times (3 + 2) = 35$ 2. $17 - (3 + 2) = 12$
3. $2 + (25 \div 5) = 7$ 4. $(2 + 25) \div 3 = 9$
5. $2 \times (5^2 + 1) = 52$ 6. $(5 \times 7 - 30)^2 = 25$
7. $(100 \div 25) \times 2 = 8$ 8. $100 \div (25 \times 2) = 2$
9. $16 - (12 \div 4) = 13$ 10. $24 + (3 \times 2) = 30$
11. $(24 + 3) \times 2 = 54$ 12. $15 - (6 - 2) = 11$

Star Challenge 13

Brackets and letters

1. $a = 7$ 2. $b = 2$ 3. $c = 5$
4. $d = 3$ 5. $e = 3$ 6. $f = 6$
7. $g = 3$ 8. $h = 10$ 9. $i = 16$
10. $j = 3$ 11. $k = 12$ 12. $m = 209$
13. $n = 4$ 14. $p = 5$ 15. $q = 10$

Star Challenge 14

Decimal tenths, hundredths and thousandths

The next 4 terms in each sequence are given here:

1) 5.976   5.978   5.980   5.982
2) 5.985   5.989   5.993   5.997
3) 5.975   5.972   5.969   5.966
4) 4.359   4.361   4.363   4.365
5) 6.027   6.031   6.035   6.039
6) 3.228   3.233   3.238   3.243

Star Challenge 15

Multiplying decimals

1) 1.5   2) 2.4   3) 6.3   4) 9.0
5) 0.8   6) 4.5   7) 0.03   8) 0.008
9) 0.004   10) 0.28   11) 0.062   12) 0.084
13) 0.246   14) 0.0590   15) 0.183   16) 8.4

Star Challenge 16

Ordering challenge

1) 7.3   2) 1.7   3) 3.51   4) 6.82
5) 9.75   6) 3.297   7) 3.68   8) 2.57
9) 5.976   5.974   5.971
10) 5.987   5.985   5.98
11) 3.373   3.273   3.173
12) 6.255   6.235   6.215
13) 7.896   7.986   8.796   9.786
14) 0.0012   0.001   0.01   0.12

Star Challenge 17

Related decimals

The next 3 terms in each sequence are given for Q1-6:

1) 6.5   7.5   8.5
2) 6.27   6.29   6.31
3) 7.22   7.25   7.28
4) 5.37   5.41   5.45
5) 3.217   3.219   3.221
6) 6.345   6.349   6.353

Q7-16: the number halfway between each pair:

7) 3.95   8) 4.05   9) 3.76   10) 4.05
11) 3.99   12) 5.58   13) 5.985   14) 6.154
15) 7.387   16) 2.966

Q17-20: put $<$ or $>$ between each pair:

17) $<$ 18) $>$ 19) $>$ 20) $<$

Star Challenge 18

Rounding challenge

Q1-6 round values to nearest whole number:

1) 130   2) 19   3) 9   4) 4   5) 7   6) 7

Q7-12 round values to 1 d.p.:

7) 5.5   8) 676.7   9) 36.7
10) 5.5   11) 11.8   12) 16.3

Star Challenge 19

Sensible answers

Student has been given a problem and the related calculation. Student must work out answer using a calculator and give it in a sensible rounded form.

1) £58.19   2) 952 people   3) £203.79
4) 125 students   5) £78.31

Star Challenge 20

Chain calculation

43   99   337   1517

Star Challenge 21

Single stage problems

All working should be shown.

1. 25   2. 552   3. 1444   4. 2550   5. 440
6. 3203   7. 1883   8. 1729   9. (a) £441 (b) 94

Star Challenge 22

Multi-stage problems

1. £509   2. £793   3. double 14
4. 69   5. £954   6. 1949   7. 395

[2 marks for each question : 1 for accuracy and 1 for working]