

# 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  $3 \times 0.4$  and  $3 \times 0.04$

“Evaluate” means “find the value of”.



Idea

$$3 \times 4 = 12$$

$$\text{so } 3 \times 0.4 = 1.2$$

$$\text{and } 3 \times 0.04 = 0.12$$

Evaluate:

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

### T6.2: Multiplying a decimals by a decimal

A useful shortcut

$$\begin{array}{ccc} 0.2 & \times & 0.3 & = & 0.06 \\ \uparrow & & \uparrow & & \uparrow \uparrow \\ \text{total number of decimal} & & & & \text{total number of decimal} \\ \text{places before multiplication} & & & & \text{places after multiplication} \end{array}$$

$$\begin{array}{r} 2 \times 3 = 6 \\ \div 10 \downarrow \quad \div 10 \downarrow \quad \downarrow \div 100 \\ 0.2 \times 0.3 = 0.06 \end{array}$$

EXAMPLE  $0.11 \times 0.04 = ?$



Fission

$$11 \times 4 = 44$$

There are 4 decimal places in the question.

$$\text{so, } 0.11 \times 0.04 = \boxed{0.0044}$$

EXAMPLE  $0.035 \times 0.02 = ?$



Chyps

$$35 \times 2 = 70$$

There are 5 decimal places in the question.

$$\text{so, } 0.035 \times 0.02 = \boxed{0.00070}$$

Evaluate:

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

### T6.3: True or false ?

$$0.8 = 8 \text{ tenths} \quad \& \quad 0.80 = 8 \text{ tenths and } 0 \text{ hundredths} \quad \text{so } 0.80 = 0.8$$

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.  $0.79 = 0.790$

## T6.4: Ordering decimals

**EXAMPLE** Which is the bigger 2.437 or 2.473 ?

both numbers  
have 2 units  
and 4 tenths

2.437  
2.473

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

2.473 is bigger.

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

Which is the bigger number ?

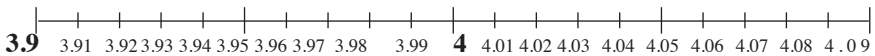
- 1) 4.6 4.9                      2) 3.75 3.78                      3) 2.953 2.778  
4) 3.61 3.59                      5) 7.77 7.39                      6) 0.823 0.832

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



## T6.5: Decimal tenths and hundredths



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:

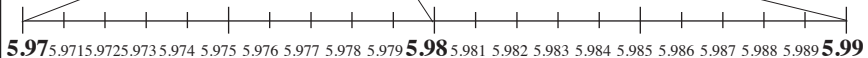
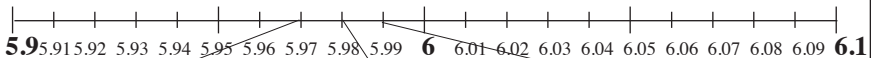
- 7) 2.47 2.43 2.41 2.49                      8) 3.26 3.28 3.21 3.25  
9) 5.21 5.35 5.71 5.19                      10) 3.9 3.93 3.87 3.89

Star Challenge **14**

**ON YOUR OWN**

All correct = 1 star

**Decimal tenths, hundredths and thousandths**



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**

12-16 correct = 1 star

Evaluate:

- 1)  $5 \times 0.3$     2)  $0.6 \times 4$     3)  $2.1 \times 3$     4)  $4.5 \times 2$   
 5)  $0.1 \times 8$     6)  $1.5 \times 3$     7)  $0.1 \times 0.3$     8)  $0.02 \times 0.4$   
 9)  $0.2 \times 0.02$     10)  $1.4 \times 0.2$     11)  $3.1 \times 0.02$     12)  $0.42 \times 0.2$   
 13)  $1.23 \times 0.2$     14)  $2.45 \times 0.02$     15)  $0.61 \times 0.3$     16)  $2.1 \times 4$

• Your teacher has the answers to these.

**Star Challenge 16-16****Ordering challenge**

14 correct = 2 stars

10-13 correct = 1 star

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**

18-20 correct = 2 stars

15-17 correct = 1 star

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 &gt; or &lt; 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.

## WORKING TOGETHER

### T7.1: Rounding calculator values

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

1.  $73 \div 13 = 5.615386$



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



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.  $120 \div 13 = 9.230769$   
 ↑ Up ? or Down ?

What is  $120 \div 13$  to the nearest whole number ?



Fission

3.  $75 \div 6 = 12.5$   
 ↑ Up ? or Down ?



Chyps

What is  $75 \div 6$  to the nearest whole number ?

$\sqrt{20}$  to 1 decimal place ?

$\sqrt{\quad} \quad 20 = 4.472135955 \dots$

4.47... lies between 4.4 and 4.5



Big Edd

4.47 .....

↑ 7 is more than 5, so we round up

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

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

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

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

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

## 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.

$$\text{New price} = \text{£}44.99 \times 1.1 = \text{£}49.489 \approx \boxed{\text{£}49.49} \text{ (to the nearest penny)}$$

*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.*

1.  $147 \div 34$

2.  $634 \div 24$

3.  $37.87 + 4.3$

4.  $\sqrt{59.876}$

5.  $35.1 \times 2.7$

6.  $\sqrt{33}$

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

7.  $367 \div 12$

8.  $678 \div 13$

9.  $462 \times 0.48$

10.  $57.93 \times 4.7$

11.  $0.34 \times 2.7$

12.  $876 \times 0.07$



## Star Challenge 18\*18

### Rounding challenge

12 correct = 2 stars  
9-11 correct = 1 star

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. $14.84 \times 45.6$ | 9. $56.43 \times 0.65$ |
| 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

4-5 correct = 1 star

Work out the answer to each calculation, using a calculator.

Give the answer in a sensible rounded form.

- The price of a pair of jeans was £55.95. The price was then increased by 4%.

New price =  $1.04 \times £55.95 = £\dots\dots\dots$

- 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  $\approx 0.03 \times 31743 = \dots\dots\dots$  people



Headbanger

- The price of a computer was £239.75. In a sale, the price was reduced by 15%.

Sale price =  $0.85 \times £239.75 = £\dots\dots\dots$

- The number of students in Y10 is 187. On the worst day of a 'flu' epidemic, 67% were absent.

Number absent =  $0.67 \times 187 = \dots\dots\dots$

- A DVD player is priced at £89.50. In a sale, the price is reduced by 12.5%

Sale price =  $0.875 \times £89.50 = £\dots\dots\dots$

• Your teacher has the answers to these.

## Star Challenge 20

### Chain calculation

4 correct answers = 1 star



Letmewin

Work out $35.6 \times 1.2$
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.



Inaspin

• Your teacher has the answers to this.

# Students' Answers

## 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**

8-9 correct = 1 star

**Working with brackets**

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

**Star Challenge 12**

10-12 correct = 1 star

**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**

14-15 correct = 2 stars

12-13 correct = 1 star

**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**

All correct = 1 star

**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**

12-16 correct = 1 star

**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**

14 correct = 2 stars

10-13 correct = 1 star

**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**

18-20 correct = 2 stars

15-17 correct = 1 star

**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**

12 correct = 2 stars

9-11 correct = 1 star

**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**

4-5 correct = 1 star

**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**

4 correct answers = 1 star

**Chain calculation**

43    99    337    1517

**Star Challenge 21**

9-10 correct = 2 stars

7-8 correct = 1 star

**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**

12-14 marks = 2 stars

8-11 marks = 1 star

**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]*