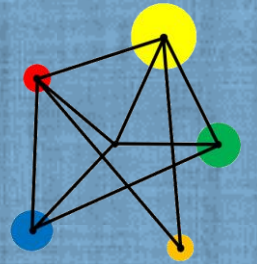


Rounding & Estimating



Round numbers to a given accuracy

Round numbers to a given number of decimal places

Round numbers to a given number of significant figures

Understand truncation of numbers

Vocabulary

Estimate (verb)

To calculate approximately.

Estimate (noun)

An approximate value.

Decimal Places

The digits to the right of the decimal point.

Key Facts

Sometimes we do not need all the digits of a number.

For example, the population of the world is 8,012,324,945.
We could round this to 8 000 000 000 (8 billion).

There is a special number called π which is approximately 3.1415926535.
This is often rounded to 3.14.

Example: Rounding to a given accuracy

Round 1984.73

a) To the nearest whole number

b) To the nearest tenth

Solution

Round 1984.73

a) To the nearest whole number

= 1985

b) To the nearest tenth

= 1984.7

Exercise

Round:

- 1) 257 to the nearest 10.
- 2) 617 to the nearest 100.
- 3) 13.6 to the nearest whole number.
- 4) 3579 to the nearest thousand.
- 5) 452 to the nearest 20.
- 6) 1 760 to the nearest 10.

Round:

- 1) 2.86 to the nearest tenth.
- 2) 0.5768 to the nearest whole number.
- 3) 98.8079 to the nearest hundredth.
- 4) 21.65 to the nearest 0.5.
- 5) 0.99 to the nearest tenth.

Challenge

How would you round 8.5 to the nearest whole number?

Solutions

Round:

- 1) 257 to the nearest 10.
260
- 2) 617 to the nearest 100.
600
- 3) 13.6 to the nearest whole number. **14**
- 4) 3579 to the nearest thousand. **4 000**
- 5) 452 to the nearest 20.
460
- 6) 1 760 to the nearest 10.
1 760

Round:

- 1) 2.86 to the nearest tenth.
2.9
- 2) 0.5768 to the nearest whole number. **1**
- 3) 98.8079 to the nearest hundredth. **98.81**
- 4) 21.65 to the nearest 0.5.
21.5
- 5) 0.99 to the nearest tenth.
1.0

Challenge

How would you round 8.5 to the nearest whole number?

9.

Whenever we come across a 5 after the rounding position we round upwards.

Example: Decimal Places

Round 3.1415926535 to:

a) 2 decimal places

b) 3 decimal places

Solution

Round 3.1415926535 to:

a) 2 decimal places

$$3.14\color{red}{|}15926535 = 3.14 \text{ (2 d.p.)}$$

b) 3 decimal places

$$3.141\color{red}{|}5926535 = 3.142 \text{ (3 d.p.)}$$

Round up if the next digit is 5 or greater.
No other digits change.

Exercise

Round these numbers to 2 decimal places

1. 2.3511
2. 28.141
3. 11.918
4. 107.466
5. 8.405
6. 38.345

Round these numbers to the number of decimal places in brackets

1. 77.8154 (3 d.p)
2. 9.5555 (2 d.p)
3. 9.454 (1 d.p)
4. 77.8154 (2 d.p)
5. 7.99 (1 d.p)

Challenge

A number has been rounded to two decimal places.

The result is 2.4.

- a) What is the smallest the original number could have been?
- b) What is the largest the original number could have been?

Exercise

Round these numbers to 2 decimal places

1. 2.3511 **2.35**
2. 28.141 **28.14**
3. 11.918 **11.92**
4. 107.466 **107.47**
5. 8.405 **8.41**
6. 38.345 **38.35**

Round these numbers to the number of decimal places in brackets

1. 77.8154 (3 d.p) **77.815**
2. 9.5555 (2 d.p) **9.56**
3. 9.454 (1 d.p) **9.5**
4. 77.8154 (2 d.p) **77.82**
5. 7.99 (1 d.p) **8.0**

Challenge

A number has been rounded to two decimal places.

The result is 2.4.

a) What is the smallest the original number could have been? **2.35**

b) What is the largest the original number could have been?

Up to but not including 2.45

Example: Significant Figures

Round 3.1415926535 to 4 significant figures

Round 8,245,491 to 3 significant figures

Solutions

Round 3.1415926535 to 4 significant figures

3.141|5926535

= 3.142 (2 s.f.)

Round 8,245,491 to 3 significant figures

8,24|5,491

= 8,250,000 (3 s.f.)

Exercise

Round these numbers to 3 significant figures.

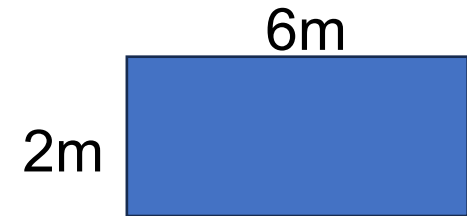
- 1) 16.428
- 2) 19,882
- 3) 0.7619
- 4) 325,010
- 5) 12.091
- 6) 154.59

Round these numbers to the number of significant figures in brackets.

- 1) 16 789 (3 s.f.)
- 2) 0.00709 (2 s.f.)
- 3) 899 899 (2 s.f.)
- 4) 99 (1 s.f.)
- 5) 8.499 (1 s.f.)

Challenge

The sides of this rectangle have been rounded to 1 significant figure.



What is the largest value that the area of the rectangle could have taken?

Solutions

Round these numbers to 3 significant figures.

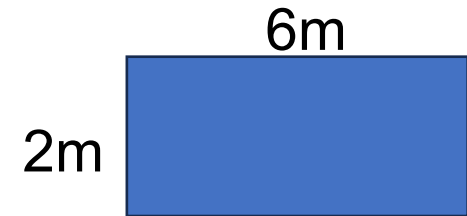
- 1) 16.428 **16.4**
- 2) 19,882 **19 900**
- 3) 0.7619 **0.762**
- 4) 325,010 **325 000**
- 5) 12.091 **12.1**
- 6) 154.59 **155**

Round these numbers to the number of significant figures in brackets.

- 1) 16 789 (3 s.f.) **16 800**
- 2) 0.00709 (2 s.f.) **0.0071**
- 3) 899 899 (2 s.f.) **900 000**
- 4) 99 (1 s.f.) **100**
- 5) 8.499 (1 s.f.) **8**

Challenge

The sides of this rectangle have been rounded to 1 significant figure.



What is the largest value that the area of the rectangle could have taken? **16.25m²**

Example: Truncation

Truncate 3.1415926535 after:

a) 2 decimal places

b) 3 decimal places

Solutions

Truncate 3.1415926535 after:

a) 2 decimal places

3.14

b) 3 decimal places

3.141

You try...

- (a) Truncate 2 342 653 after the thousands digit.
- (b) Truncate 4.293 after the units digit.
- (c) Truncate 16.09475 after the 2nd decimal place.

Solutions

(a) Truncate 2 342 653 after the thousands digit. **2 342 000**

(b) Truncate 4.293 after the units digit. **4**

(c) Truncate 16.09475 after the 2nd decimal place. **16.09**

Extension

A number is rounded to 2 decimal places.

The result is then rounded to 1 decimal place.

The final answer is 4.8.

What could the original number have been?

Solution

A number is rounded to 2 decimal places.

The result is then rounded to 1 decimal place.

The final answer is 4.8.

What could the original number have been?

Any number from 4.745 up to (but not including) 4.845

Exam Style Question

- a) Write 12.55 to the nearest whole number
- b) Write 3664 to the nearest hundred.
- c) Write 2.68 correct to 1 decimal place
- d) Write 78.49 to 2 significant figures

Solution

- a) Write 12.55 to the nearest whole number **13**
- b) Write 3664 to the nearest hundred. **3700**
- c) Write 2.68 correct to 1 decimal place **2.7**
- d) Write 78.49 to 2 significant figures **78**