

Order of Operations

Solutions

For Pearson Edexcel GCSE Mathematics (1MA1) • Foundation tier

Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

1 (5 marks)

Work out

(a) $7 + 2 \times 6$

Multiply before you add.

$$2 \times 6 = 12$$

$$7 + 12 = 19$$

Answer: 19

Tip: Do not work from left to right here. $7 + 2 = 9$, then $9 \times 6 = 54$, is wrong.

(b) $30 \div (2 + 4)$

Work out the brackets first.

$$2 + 4 = 6$$

$$30 \div 6 = 5$$

Answer: 5

(c) $4^2 - 3 \times 2$

Work out the power (index) first: $4^2 = 16$

Then multiply: $3 \times 2 = 6$

Then subtract: $16 - 6 = 10$

Answer: 10

(d) $18 - 6 \div 3 + 1$

Divide first: $6 \div 3 = 2$

Then subtract and add from left to right:

$$18 - 2 = 16$$

$$16 + 1 = 17$$

Answer: 17

Tip: After dividing, work from left to right: $18 - 2 + 1 = 17$. Doing $2 + 1$ first would give 15, which is wrong.

(e) $(8 + 4) \div (5 - 2)$

Work out both brackets first.

$$8 + 4 = 12$$

$$5 - 2 = 3$$

$$12 \div 3 = 4$$

Answer: 4

2 (1 mark)

Here is a calculation.

$$3 \times 8 - 4 \div 2 = 10$$

Put brackets in to make the calculation correct.

Without brackets: $24 - 2 = 22$, which is wrong.

We need something $\div 2 = 10$, so the part before $\div 2$ must be 20.

$$3 \times 8 - 4 = 24 - 4 = 20$$

So put brackets round $3 \times 8 - 4$:

$$(3 \times 8 - 4) \div 2 = 20 \div 2 = 10 \quad \checkmark$$

Answer: $(3 \times 8 - 4) \div 2 = 10$

Tip: Try your brackets and work the calculation out. Check that it really gives the answer you need.

3 (2 marks)

Work out $\frac{5^2 + 11}{2 \times 3}$

A fraction line acts like brackets round the top and round the bottom.

Top: $5^2 + 11 = 25 + 11 = 36$

Bottom: $2 \times 3 = 6$

Then divide: $36 \div 6 = 6$

Answer: 6

Marks: 1 mark for 36 or 6 (the top or the bottom). 1 mark for 6.

4 (3 marks)

(a) Use your calculator to work out $\frac{\sqrt{19.6}}{2.1^2 - 1.8}$

Write down all the figures on your calculator display.

Work out the top: $\sqrt{19.6} = 4.427188 \dots$

Work out the bottom: $2.1^2 - 1.8 = 4.41 - 1.8 = 2.61$

Divide: $4.427188 \dots \div 2.61 = 1.696240 \dots$

Answer: 1.696240...

Tip: Use the fraction button on your calculator, or put brackets round the whole bottom: $\sqrt{19.6} \div (2.1^2 - 1.8)$.

Marks: 1 mark for 4.427... or 2.61. 1 mark for 1.696240...

(b) Write your answer to part (a) correct to 2 decimal places.

1.696...

The third decimal place is 6, which is 5 or more.

So round up: 1.69 becomes 1.70

Answer: 1.70

5 (2 marks)

Fatima says $12 - 4^2 \div 8 = 10$

Is Fatima correct?

You must show your working.

Work out the power first: $4^2 = 16$

Then divide: $16 \div 8 = 2$

Then subtract: $12 - 2 = 10$

This gives 10, so Fatima is correct.

Answer: Yes, it equals 10

Marks: 1 mark for $16 \div 8 = 2$. 1 mark for "Yes" with correct working.

6 (2 marks)

Work out $2 \times (9 - 4)^2 - \sqrt{64}$

Brackets first: $9 - 4 = 5$

Then the power: $5^2 = 25$

And the square root: $\sqrt{64} = 8$

Then multiply: $2 \times 25 = 50$

Then subtract: $50 - 8 = 42$

Answer: 42

Marks: 1 mark for 25 or 8 with a correct order of working. 1 mark for 42.

7 (2 marks)

Ben works out $5 + 3 \times 4^2$

He gets the answer 128

- (a) Explain the mistake Ben has made.

Ben added $5 + 3 = 8$ first, then did $8 \times 4^2 = 8 \times 16 = 128$.

But you must do powers first, then multiply, then add.

Answer: He worked out $5 + 3$ first; he should work out 4^2 first, then multiply, then add

Tip: When you explain a mistake, say what they did wrong **and** what they should have done first.

- (b) Work out the correct value of $5 + 3 \times 4^2$

Power first: $4^2 = 16$

Then multiply: $3 \times 16 = 48$

Then add: $5 + 48 = 53$

Answer: 53

8 (3 marks)

- (a) Use your calculator to work out $\frac{(5.7 + 2.8)^2}{3.9 \times 1.6}$
Write down all the figures on your calculator display.

Work out the top: $5.7 + 2.8 = 8.5$, then $8.5^2 = 72.25$

Work out the bottom: $3.9 \times 1.6 = 6.24$

Divide: $72.25 \div 6.24 = 11.57852564 \dots$

Answer: 11.57852564...

Marks: 1 mark for 72.25 or 6.24. 1 mark for 11.57852564...

- (b) Write your answer to part (a) correct to 1 decimal place.

11.578 ...

The second decimal place is 7, which is 5 or more.

So round up: 11.6

Answer: 11.6

9 (1 mark)

Write one pair of brackets in the expression so that its value is 31

$$2 + 4 \times 5 + 1$$

Without brackets: $2 + 20 + 1 = 23$, which is too small.

Try adding $2 + 4$ first:

$$(2 + 4) \times 5 + 1 = 6 \times 5 + 1$$

$$= 30 + 1 = 31 \quad \checkmark$$

Answer: $(2 + 4) \times 5 + 1$
