Set 28

Order of Operations Review

These are the sections you must complete in this set:

- ✓ **Topic Questions**
- ✓ **Problem Solving**
- ✓ **Challenge Questions**

BODMAS or BIDMAS

Either acronym can be used when using the **order of operations** rules for simplifying expressions.

The acronym **BODMAS** is used to remember the correct order as follows:

B	Brackets are always completed first.
O	Of or Orders. Indicates powers and square roots, etc.
DM	Division & Multiplication, performed left to right.
AS	Addition & Subtraction, performed left to right.

Similarly, the acronym **BIDMAS** is used to remember the correct order as follows:

B	Brackets are always completed first.
I	Indices. Indicates powers and square roots, etc.
DM	Division & Multiplication, performed left to right.
AS	Addition & Subtraction, performed left to right.

Regardless of which acronym you prefer, always follow these simple rules:

- The operations inside brackets are always calculated first.
- If there is more than one set of brackets, calculate the operations inside the innermost brackets first.
- Multiplication and division operations are calculated in the order they appear.
- Addition and subtraction operations are calculated in the order they appear.

Example: $15 + 6 \times 9 \div 3 - 1$ Multiplication first
$= 15 + 54 \div 3 - 1$ Division next
$= 15 + 18 - 1$ Addition next
$= 33 - 1$ Subtraction last
$= 32$

Example: $56 - 4 \times 8 + 2$ Multiplication first
$= 56 - 32 + 2$ Subtraction next
$= 24 + 2$ Addition last
$= 26$

Example: $56 \div (6 + 2) - 4$ Brackets first
$= 56 \div 8 - 4$ Division next
$= 7 - 4$ Subtraction last
$= 3$

Topic Questions

1. Calculate each of the following using the order of operations rules.

(a) $3 + 4 \div 2$ 5

(b) $8 + 1 \times 12$ 20

(c) $24 \div (12 - 4)$ 3

(d) $15 \times (17 - 15)$ 30

(e) $11 + 6 \times 8$ 59

(f) $30 - 45 \div 9$ 25

(g) $56 \div (7 + 1)$ 7

(h) $12 \times (20 - 12)$ 96

(i) $3 \times 4 + 23 - 10 - 5 \times 2$ 15

(j) $42 \div 7 \times 8 - 8 \times 3$ 24

(k) $10 + 40 \div 5 + 14$ 32

(l) $81 \div 9 + 108 \div 12$ 18

(m) $16 + 12 \div 2 \times 10$ 76

(n) $(18 - 15) \div 3 \times 27$ 27

(o) $4 + (6 + 3 \times 9) - 11$ 26

(p) $52 \div 13 + 75 \div 25$ 7

(q) $(12 - 3) \times 8 \div 6$ 12

(r) $88 \div (24 - 13) \times 12$ 96

(s) $(4 + 5) \times (20 - 14) \div 2$ 27

(t) $\{[(16 + 4) \div 4] - 2\} \times 6$ 18

2. Replace each # symbol with one of the four operations (+ , − , × , ÷) to make each of the following equations true.

(a) $26 - 21 \ \# \ 3 = 19$ $26 - 21 \div 3 = 19$

(b) $14 \ \# \ 7 + 5 \ \# \ 3 = 17$ $14 \div 7 + 5 \times 3 = 17$

(c) $5 \ \# \ 6 \ \# \ 2 = 8$ $5 + 6 \div 2 = 8$

(d) $(8 \ \# \ 22) \ \# \ 10 = 3$ $(8 + 22) \div 10 = 3$

(e) $8 \ \# \ 5 \ \# \ 2 = 18$ $8 + 5 \times 2 = 18$

Solve each of the following using the order of operations rules.

3. $(14 - 2) \times (2 + 2) - 10$ 38

4. $5(32 \div 4) + 2 \times 5 - 1$ 49

5. $(2 + 3)(5 - 2) + 3$ 18

6. $2(20 - 5 \times 2) \div 4$ 5

7. $6^2 - (2 + 3)^2$ 11

8. $\dfrac{43 - 1}{4 + 2} + 10$ 17

9. $(4280 + 1720 + 1200 \div 4) - 50 \times 66$ 3 000

10. $\dfrac{46 - 8 \div 4 \times 5}{1 + 5}$ 6

11. $\dfrac{16 - 3 \times 4 + 8}{2 \times 3}$ 2

12. $\dfrac{38 - 48 \div 6}{15 - 5}$ 3

Problem Solving

1. Jenny drinks 16.5 litres of water a week. Jane drinks 1.9 litres of water a day. How many litres of water will they drink together in a fortnight ?

Answer: 59.6 litres

2. If three-sevenths of a number is 72, what is the number ?

Answer: 168

3. On a particular public holiday, workers earn $1\frac{3}{4}$ times their normal pay. If a worker earns $220 on a normal day, how much will they earn on the public holiday ?

Answer: $385

4. Find the missing number in the following number pattern.

2 , 6 , 12 , ? , 30 , 42 , 56

Answer: 20

5. At a restaurant, the menu offers a three course meal from a selection of 5 entrees, 4 main meals and 6 deserts. How many different three course meals is it possible to create from this menu ?

Answer: 120

6. Complete the following number pattern.

36 , 49 , 64 , 81 , 100 , ?

Answer: 121

7. Jack wishes to buy a car but has only $37 500 to spend. He finds a car that he likes but it is priced at $39 500. If the salesman is willing to give a 5 % discount on the price, will Jack have enough money to buy the car ?

Answer: No. The car will cost $37 525 after the discount

Challenge Questions

1. Gordon and Liam both paint houses. It takes Gordon 3 hours to paint a room while it takes Liam 4 hours to paint the same room. How many minutes, rounded to the nearest minute, will it take them to paint the same room if they are working together ?

Answer: $1\frac{7}{12}$ hours = 103 minutes

2. A flight from Melbourne to Darwin takes 5 hours. Due to daylight saving, there is a time difference between the cities with Darwin being 1 hour 30 minutes behind Melbourne. If the plane leaves Melbourne at 9:20 am, what time will it be in Darwin when it arrives ?

Answer: It will arrive in Darwin at 12:50 pm

3. George's large farm is 12.5 km long and 7.8 km wide. What is the area of his farm in square kilometres ? How many hectares is this equivalent to ?

Answer: 97.5 square kilometres = 9 750 hectares

4. Emma and Lucy both took a spelling test containing 25 questions. Emma scored 92 % and Lucy scored 76 %. How many more questions did Emma get correct compared to Lucy ?

Answer: Emma get 4 more questions correct

5. Jackie saw a jumper for $95. It is now on sale for 40 % off. How much will Jackie save if she buys the jumper during the sale ?

Answer: Jackie will save $38

6. David has 40 marbles and Michael has 56 marbles. How many marbles does David need to give to Michael so that Michael has twice as many marbles as David ?

Answer: David needs to give 8 marbles to Michael

Set 29

Percentages Review

These are the sections you must complete in this set:

- ✓ **Topic Questions**
- ✓ **Problem Solving**
- ✓ **Challenge Questions**

Revision of percentages

A **percentage** represents a "number out of 100" or a "fraction of 100". The percent symbol **%** is used to indicate a number that is a percentage. For example, if 40% of a school are girls then this indicates that 40 out of every 100 students in the school are girls.

Converting percentages

Percentages to Fractions

Since percentages represent an amount "out of 100", percentages can be changed to fractions with a denominator of 100.

Examples: $72\ \% = \frac{72}{100} = \frac{36}{50} = \frac{18}{25}$

Percentages to Decimals

Move the decimal point two places to the left and remove the % symbol.

Examples: $37\ \% = 0.37$ $23.5\ \% = 0.235$

Fractions to Percentages

To convert fractions to percentages, simply multiply the fraction by 100 %.

Example: $\frac{1}{8} = 0.125 \times 100\ \% = 12.5\ \%$

Decimals to Percentages

To convert decimals to percentages, multiply the decimal by 100 %.

Examples: $0.75 = 0.75 \times 100\ \% = 75\ \%$

Topic Questions

1. Convert the following into percentages:

(a) 0.45 — 45 %

(b) $\frac{3}{5}$ — 60 %

(c) 3.05 — 305 %

(d) $\frac{3}{10}$ — 30 %

(e) 0.125 — 12.5 %

(f) $1\frac{3}{8}$ — 137.5 %

2. Express the first quantity as a percentage of the second quantity.

(a) 8 km, 25 km — 32 %

(b) 4.2 m, 6 m — 70 %

(c) 35 kg, 10 kg — 350 %

(d) 64 cents, $1.60 — 40 %

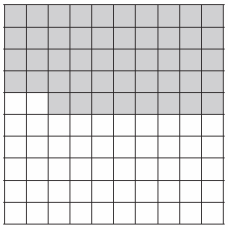
3. A class has 14 girls and 11 boys. What percentage of the class are girls and what percentage of the class are boys ?

Answer: 56 % girls and 44 % boys.

4. In a basketball game Andrew scored 27 points. Andrew's team scored 72 points in total. What percentage of the team's score was shot by Andrew ?

Answer: 37.5 %

5. Refer to the diagram on the right.



(a) What percentage is shaded ? 48 %

(b) What percentage is unshaded ? 52 %

6. Anthony drank 40 % of his 650 ml water bottle. How much water remains in the bottle ?

Answer: 390 ml

Problem Solving

1. A school has 1000 students. If 12.5 % of the students have blonde hair and blue eyes, how many students do not have blonde hair and blue eyes ?

Answer: 875 students

2. The MCG holds approximately 100 000 people. A one-day cricket match between Australia and India is attended by 72 500 people. What percentage of the seats are empty ?

Answer: 27.5 %

3. What is 65 % of eight kilometres in metres ?

Answer: 5 200 metres

4. A total of 360 children took part in an art competition. If 30 % of them were boys, how many girls took part in the competition ?

Answer: 252

5. Samuel's daily wage is $88. His daily wage is 10 % more than Ben's daily wage. Calculate Ben's daily wage.

Answer: $80

6. Laura read 120 pages of a 500-page novel on Friday. She then finished reading 80 % of the remaining pages during the weekend. What percentage of the novel remains unread ?

Answer: 15.2 %

7. The population of a small country town increases by 8 % every year. If this year's population is 5 000, what will be the population in two year time ?

Answer: 5 832

8. Michael bought a block of land for $250 000. When the value of the land increased by 60%, he decided to sell the land. What price was the land sold for ?

Answer: $400 000

Challenge Questions

1. Calculate each of the following:

(a) 6 % of $75 $4.50

(b) 48 % of $20 $9.60

(c) 35 % of $15 $5.25

(d) 5 % of $142 $7.10

(e) 7 % of $350 $24.50

(f) 95 % of $28 $26.60

(g) 12.5 % of $44 $5.50

(h) 37.5 % of $144 $54.00

2. 38% of a bag of marbles are red and 18% are blue. The rest are green. What percentage of the marbles are green ?

Answer: 44 % are green

3. Of 160 cars, 45% are white. How many of the cars are white ?

Answer: 72 cars are white

4. Out of 960 students, 30% were absent. How many of the students were present at school ?

Answer: 672 students were present at school

5. 80 % of a number is 400. What is the number ?

Answer: 500

6. The length and width of a rectangle are both increased by 50 %. Find the percentage increase in the area of the new rectangle when compared to the original rectangle.

Answer: 125 %

Set 30

Converting Units of Mass

These are the sections you must complete in this set:

- ✓ **Topic Questions**
- ✓ **Problem Solving**
- ✓ **Challenge Questions**

Units of mass

The **gram** is the **base unit** of mass. The common units of mass used in everyday life are:

Name	Symbol	Size	Conversion
milligram	mg	$\frac{1}{1000}$ gram	1 gram = 1000 mg
gram	g	1 gram	
kilogram	kg	1 000 grams	1 kg = 1 000 grams
tonne	t	1 000 000 grams	1 tonne = 1000 kg

Examples of mass

A **milligram** is:

- about the mass of a small grain of sand
- about the mass of a grain of salt

A **gram** is about:

- the mass of a paperclip
- the mass of a pen cap

A **kilogram** is about:

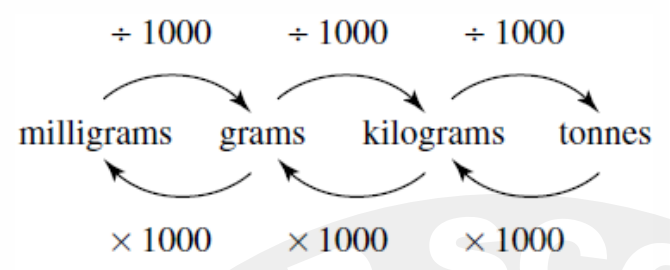
- a litre bottle of water
- a loaf and a half of bread

A **tonne** is about:

- the weight of a small car.

How to convert the units

Using the diagram below, follow these simple rules:



- The numbers next to each arrow are called **conversion factors**.
- When converting to a **larger** unit, always **DIVIDE** by the conversion factor.
- When converting to a **smaller** unit, always **MULTIPLY** by the conversion factor.
- Always remember to include the unit abbreviation in your answer.

Example: Convert 8.25 kg to mg.

First convert to grams, then to milligrams.

Use the conversion factors 1 kg = 1 000 grams and 1 gram = 1 000 mg.

As the conversion is to a **smaller** unit, **multiply** 8.25 kg.

$\therefore$ 8.25 kg = 8.25 × 1 000 g = 8 250 g

= 8 250 × 1 000 mg = 8 250 000 mg

Example: Convert 2 345 kg to tonnes.

Use the conversion factor 1 tonne = 1 000 kg.

As the conversion is to a **larger** unit, **divide** 2 345 kg.

$\therefore$ 2 345 kg = 2 345 ÷ 1 000 t = 2.345 t

Mass of water

Use the following conversions for water capacity:

- 1 millilitre of water = 1 gram
- 1 litre of water = 1 kg
- 1000 litres of water = 1000 kgs = 1 tonne

Example: What is the mass of water in a tank containing 4 500 litres.

Use the conversion 1 litre = 1 kg.

$\therefore$ 4 500 litres = 4 500 kg

= 4 500 ÷ 1 000 t

= 4.5 tonnes

Topic Questions

1. Arrange the following in order of mass, from lightest to heaviest:

brick , feather , car , lunch box , egg , bag of concrete

feather , egg , lunch box . brick , bag of concrete, car

2. Convert the following to kilograms:

(a) 500 g 0.5 kg **(b)** 8.39 t 8 390 kg

(c) 16 000 mg 16 kg **(d)** 0.25 t 250 kg

3. Convert the following to grams:

(a) 5.6 kg 5 600 g **(b)** 750 mg 0.75 g

(c) 6.375 kg 6 375 g **(d)** 4 t 4 000 000 g

4. Convert the following to milligrams:

(a) 16 g 16 000 mg **(b)** 45 kg 45 000 000 mg

(c) 0.085 g 85 mg **(d)** 0.6 t 600 000 000 mg

5. Convert the following to tonnes:

(a) 375 kg 0.375 t **(b)** 1 500 000 g 1.5 t

(c) 2 400 kg 2.4 t **(d)** 65 000 000 mg 0.065 t

6. There are 12 cans in a box. If each can has a mass of 425 g, what is the total mass of the cans in the box in kilograms ?

Answer: 5.1 kg

7. If Sally goes to the supermarket and buys 500 g butter, 200 g yoghurt, 810 g tinned pears, 425 g tinned apricots and 1 kg sugar, what is the total mass of her purchase in kilograms ?

Answer: 2.935 kg

Problem Solving

1. A ship has a mass of 36 500 000 kg. What is this in tonnes?

Answer: 36 500 tonnes

2. There are five members in a family and the average mass is 52.5 kg.
What is the total mass of the family ?

Answer: 262.5 kg

3. A truck and its full load have a combined mass of 33 tonnes 600 kilograms. The mass of the truck is one-third of this. What is the mass of the load ?

Answer: 22 tonnes 400 kg

4. Simon had a mass of 75 kg before a long mountain trek. If he lost 7.3 kg during the trek, what is his mass after the trek ?

Answer: 67.7 kg

5. Michael built a garden wall with sandstone blocks. Each block has a mass of 15 kg, and he used 144 blocks in total. What is the mass of the blocks in tonnes ?

Answer: 2.16 tonnes

6. Megan buys a 2.5 kg bag of flour and uses 360 g when baking a cake. How many grams of flour are left?

Answer: 2 140 grams

7. Adrian was building a wall with bricks, each with a mass of 2.7 kg. What is the total mass of the wall if he used 422 bricks ?

Answer: 1 139.4 kg

8. A packet of sugar weighs 800 grams. How many of these packets would weigh 1 tonne ?

Answer: 1 250 packets

Challenge Questions

1. Convert these units to the units indicated:

(a)	3 250 g	(kg)	3.25 kg
(b)	4.55 kg	(g)	4 550 g
(c)	55 400 g	(kg)	55.4 kg
(d)	0.325 kg	(g)	325 g
(e)	2 750 000 mg	(kg)	2.75 kg
(f)	0.75 t	(kg)	750 kg
(g)	875 kg	(t)	0.875 t
(h)	50 g	(mg)	50 000 mg

2. Meg wished to buy lots of items on her overseas trip. She is allowed a limit of 25 kg so she took only 10.3 kg of luggage with her. If she bought 4.3 kg of clothes, 3.1 kg of gifts, 0.73 kg of books, 2.8 kg of shoes, 2.5 kg of perfume and 2.3 kg of souvenirs, what is the mass of her luggage on the return journey ? Is she carrying too much and, if so, by how much ?

Answer: Total of 26.03 kg, so she is 1.03 kg over the limit.

3. How much does 5 000 litres of water weigh in tonnes ?

Answer: 5 tonnes

4. A 2 500 litre water tank weighs 125 kg when empty. What will it weigh when it is full ?

Answer: 2 625 kg

5. A 1 500 litre water tank weighs 95 kg when empty. What will it weigh when it is $\frac{1}{4}$ full ?

Answer: 470 kg

6. If a small bottle holds 375 ml of water and each bottle weighs 25 g when empty, how many kilograms in total will 24 bottles of water weigh ?

Answer: 9.6 kg