Knowledge Organiser
Year 11 Foundation 1-3 (Spring)

1

Learn the Golden Rule for Proportion Questions

GRADE 3

There are lots of exam questions which at first sight seem completely different but in fact they can all be done using the GOLDEN RULE...

DIVIDE FOR ONE, THEN TIMES FOR ALL

EXAMPLE: 5 pints of milk cost £1.30. How much will 3 pints cost?

The GOLDEN RULE tells you to:
Divide the price by 5 to find how much FOR ONE PINT, then multiply by 3 to find how much FOR 3 PINTS.

1 pint: £1.30 ÷ 5 = 0.26 = 26p
3 pints: 26p × 3 = 78p

EXAMPLE: Emma is handing out some leaflets. She gets paid per leaflet she hands out. If she hands out 300 leaflets she gets £2.40. How many leaflets will she have to hand out to earn £8.50?

Divide by £2.40 to find how many leaflets she has to hand out to earn £1.
To earn £1: 300 ÷ £2.40 = 125 leaflets

Multiply by £8.50 to find how many leaflets she has to hand out to earn £8.50.
To earn £8.50: 125 × £8.50 = 1062.5
So she'll need to hand out 1063 leaflets.

You need to round your answer up because 1062 wouldn't be enough.

Scaling Recipes Up or Down

GRADE 3

EXAMPLE: Judy is making orange and pineapple punch using the recipe shown on the right. She wants to make enough to serve 20 people. How much of each ingredient will Judy need?

Fruit Punch (serves 8)
800 ml orange juice
140 g fresh pineapple

The GOLDEN RULE tells you to divide each amount by 8 to find how much FOR ONE PERSON, then multiply by 20 to find how much FOR 20 PEOPLE.

So for 1 person you need:
800 ml ÷ 8 = 100 ml orange juice ⇒
140 g ÷ 8 = 17.5 g pineapple ⇒

And for 20 people you need:
20 × 100 ml = 2000 ml orange juice
20 × 17.5 g = 350 g pineapple

2

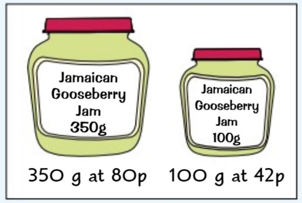
Best Buy Questions

GRADE 3

A slightly different type of direct proportion question is comparing the 'value for money' of 2 or 3 similar items. For these, follow the second GOLDEN RULE...

Divide by the PRICE in pence (to get the amount per penny)

EXAMPLE: The local 'Supplies 'n' Vittals' stocks two sizes of Jamaican Gooseberry Jam, as shown on the right. Which of these represents better value for money?



Follow the GOLDEN RULE — divide by the price in pence to get the amount per penny.

In the 350 g jar you get 350 g ÷ 80p = 4.38 g per penny
In the 100 g jar you get 100 g ÷ 42p = 2.38 g per penny

The 350 g jar is better value for money, because you get more jam per penny.

3

Mean, Median, Mode and Range

Mean, median, mode and range pop up all the time in statistics questions — make sure you know what they are.

MODE = MOST common (GRADE 2)

MEDIAN = MIDDLE value (when values are in order of size)

MEAN = TOTAL of items ÷ NUMBER of items

RANGE = Difference between highest and lowest

REMEMBER:
Mode = most (emphasise the 'mo' in each when you say them)
Median = mid (emphasise the m*d in each when you say them)
Mean is just the average, but it's mean 'cos you have to work it out.

EXAMPLE: Find the median, mode, mean, and range of these numbers: 2, 5, 3, 2, 0, 1, 3, 3

1. Rearrange the numbers into ascending order. 0, 1, 2, 2, 3, 3, 3, 5
   ← 4 numbers either side →
   The MEDIAN is the middle value. When there are two middle numbers, the median is halfway between the two. Median = 2.5

   To find the position of the median of n values, you can use the formula $(n + 1) \div 2$. Here, $(8 + 1) \div 2$ = position 4.5 — that's halfway between the 4th and 5th values.

2. MODE (or modal value) is the most common value = 3

3. MEAN = $\frac{\text{total of items}}{\text{number of items}} = \frac{0+1+2+2+3+3+3+5}{8} = \frac{19}{8} = 2.375$

4. RANGE = difference between highest and lowest values = 5 – 0 = 5

Formulas and Equations from Words

4

Sometimes, you might be asked to use an expression to solve an equation.

EXAMPLE: A zoo has x zebras and four times as many lemurs. The difference between the number of zebras and the number of lemurs is 45. How many zebras does the zoo have?

The zoo has x zebras and $4 \times x = 4x$ lemurs.

The difference is $4x - x = 3x$, so $3x = 45$, which means $x = 15$.

So the zoo has 15 zebras.

Once you've formed the equation, you need to solve it to find the value of x.

EXAMPLE: Will, Naveed and Camille give some books to charity. Naveed gives 6 more books than Will, and Camille gives 7 more books than Naveed. Between them, they give away 46 books. How many books did they give each?

Let the number of books Will gives be x.
Then Naveed gives $x + 6$ books
and Camille gives $(x + 6) + 7 = x + 13$ books
So in total they give $x + x + 6 + x + 13 = 3x + 19$ books

So $3x + 19 = 46$ — You're told this in the question.
$3x = 27$
$x = 9$

So Will gives 9 books,
Naveed gives $9 + 6 = 15$ books and
Camille gives $15 + 7 = 22$ books.

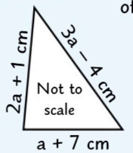
Use Shape Properties to Find Formulas and Equations

GRADE 4

In some questions, you'll need to use what you know about shapes (e.g. side lengths or areas) to come up with a formula or an equation to solve.

EXAMPLE:

a) Write a formula for P, the perimeter of the triangle below, in terms of a.



Form an expression for the perimeter:
P = (a + 7) + (2a + 1) + (3a – 4)
P = 6a + 4 cm

b) If the triangle has a perimeter of 58 cm, find the value of a.

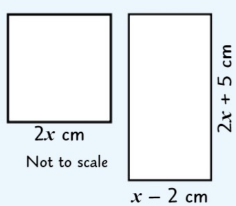
P = 58, so set your formula equal to 58 and solve to find a:
6a + 4 = 58
6a = 54
a = 9

Compare Dimensions of Two Shapes to Find Equations

GRADE 5

You might get a question that involves two shapes with related areas or perimeters — you'll have to use this fact to find side lengths or missing values.

EXAMPLE: The perimeter of the rectangle is the same as the perimeter of the square. Find the value of x.



Perimeter of square $= 2x + 2x + 2x + 2x = 8x$ cm
Perimeter of rectangle $= (2x + 5) + (x - 2) + (2x + 5) + (x - 2)$
$= 6x + 6$ cm

Set the perimeter of the rectangle equal to the perimeter of the square and solve:
$8x = 6x + 6$
$2x = 6$
$x = 3$

Doing the 'Table of Values'

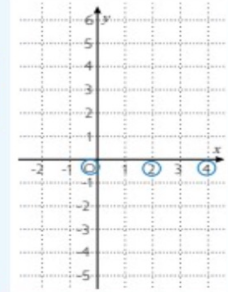
GRADE 3

5

EXAMPLE: Draw the graph of $y = 2x - 3$ for values of x from -2 to 4.

1. **Choose 3 easy x-values for your table:**
Use x-values from the grid you're given. Avoid negative ones if you can.

x	0	2	4
y			



2. **Find the y-values** by putting each x-value into the equation:

x	0	2	4
y	–3	1	5

When $x = 0$,
$y = 2x - 3$
$= (2 \times 0) - 3 = -3$

When $x = 4$,
$y = 2x - 3$
$= (2 \times 4) - 3 = 5$

Plotting the Points and Drawing the Graph

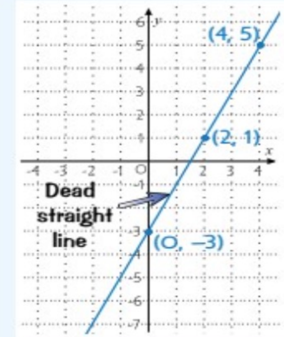
GRADE 3

EXAMPLE: ...continued from above.

3. **PLOT EACH PAIR** of x- and y- values from your table.
The table gives the coordinates (0, –3), (2, 1) and (4, 5).

Now draw a **STRAIGHT LINE** through your points.

If one point looks a bit wacky, check 2 things:
– the y-values you worked out in the table
– that you've plotted the points properly.



Finding the nth Term of a Sequence

GRADE 4

6

This method works for sequences with a common difference — where you add or subtract the same number each time.

EXAMPLE: Find an expression for the nth term of the sequence that starts 5, 8, 11, 14, ...

n:	1	2	3	4
term:	5	8	11	14
	+3	+3	+3	
3n:	3	6	9	12
	+2	+2	+2	+2
term:	5	8	11	14

So the expression for the nth term is 3n + 2

1. Find the common difference. It's 3, so this tells you '3n' is in the formula.
2. List the values of 3n.
3. Work out what you have to add or subtract to get from 3n to the term. So it's +2.
4. Put '3n' and '+2' together.

Check your formula by putting the first few values of n back in:
n = 1 gives 3n + 2 = 3 + 2 = 5 ✓
n = 2 gives 3n + 2 = 6 + 2 = 8 ✓

The *Inequality Symbols*

GRADE 3

$>$ means 'Greater than'	$\geq$ means 'Greater than or equal to'
$<$ means 'Less than'	$\leq$ means 'Less than or equal to'

REMEMBER — the one at the BIG end is BIGGEST so $x > 4$ and $4 < x$ both say: 'x is greater than 4'.

EXAMPLE: x is an integer such that $-4 < x \leq 3$. Write down all possible values of x.

Work out what each bit of the inequality is telling you:

$-4 < x$ means 'x is greater than -4',
and $x \leq 3$ means 'x is less than or equal to 3'.

Remember, integers are just whole numbers (+ve and −ve, including 0).

Now just write down all the values that x can take:

$-3, -2, -1, 0, 1, 2, 3$

-4 isn't included because of the $<$ but 3 is included because of the $\leq$.

You Can Show Inequalities on *Number Lines*

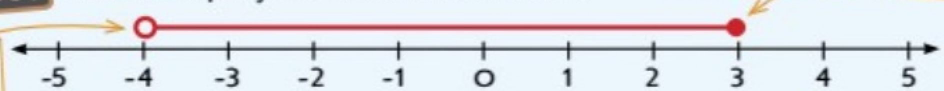
GRADE 3

Drawing inequalities on a number line is dead easy — all you have to remember is that you use an open circle (○) for $>$ or $<$ and a coloured-in circle (●) for $\geq$ or $\leq$.

EXAMPLE: Show the inequality $-4 < x \leq 3$ on a number line.

Closed circle because 3 is included.

Open circle because -4 isn't included.



Algebra with *Inequalities*

GRADE 5

Solve inequalities like regular equations but WITH ONE BIG EXCEPTION:

Whenever you MULTIPLY OR DIVIDE by a NEGATIVE NUMBER, you must FLIP THE INEQUALITY SIGN.

EXAMPLES:

1. Solve $3x - 2 \leq 13$.

Just solve it like an equation — but leave the inequality sign in your answer:

(+2) $3x - 2 + 2 \leq 13 + 2$

$3x \leq 15$

(÷3) $3x \div 3 \leq 15 \div 3$

$x \leq 5$

2. Solve $2x + 7 > x + 11$.

Again, solve it like an equation:

(−7) $2x + 7 - 7 > x + 11 - 7$

$2x > x + 4$

(−x) $2x - x > x + 4 - x$

$x > 4$

3. Solve $9 - 2x > 15$.

Watch out for the sign change:

(−9) $9 - 2x - 9 > 15 - 9$

$-2x > 6$

(÷−2) $-2x \div -2 < 6 \div -2$

$x < -3$

The $>$ has turned into a $<$, because we divided by a negative number.

Stem and Leaf Diagrams put data in *Order*

GRADE 2

An ordered stem and leaf diagram shows a set of data in order of size.
This makes it easy to find things like the median and range (see p.116).

EXAMPLE: This stem and leaf diagram shows the ages of some school teachers.

Stem	Leaf
3	3 5
4	0 5 7 8
5	1 4 9
6	1 3

Key: 5|4 = 54 years

a) How old is the oldest teacher?

Use the key to help you read off the diagram. 6 | 3 = 63 years old

b) What is the median age?

The median is the middle value.
Find its position, then read off the value.

There are 11 values, so the median is the 6th value.
So median age is 4 | 8 = 48 years

How do we use Knowledge Organisers in Mathematics

How can you use knowledge organisers at home to help us?

- **Retrieval Practice**: Read over a section of the knowledge organiser, cover it up and then write down everything you can remember. Repeat until you remember everything.
- **Flash Cards:** Using the Knowledge Organisers to help on one side of a piece of paper write a question, on the other side write an answer. Ask someone to test you by asking a question and seeing if you know the answer.
- **Mind Maps:** Turn the information from the knowledge organiser into a mind map. Then reread the mind map and on a piece of paper half the size try and recreate the key phrases of the mind map from memory.
- **Sketch it:** Draw an image to represent each fact; this can be done in isolation or as part of the mind map/flash card.
- **Teach it:** Teach someone the information on your knowledge organiser, let them ask you questions and see if you know the answers.

How will we use knowledge organisers in Mathematics?

Knowledge organisers will be used before I complete a Learning Check or Common Assessment. I will spend part of the lesson looking over each of the key topics of the half term before completing the Learning Check or Common Assessment.
I will also use these at home to complete my own independent learning and revision of these key topics.

GLUE HERE

Year 11 Mathematics (Foundation): Low Stake Test scores (Autumn)

Topics	Date	Score
Proportion (Recipes), Best buy problems, Exchange rates, Averages and Range and Stem and Leaf diagrams.		
Plotting linear graphs, Nth term of a linear sequence, Forming and solving equations and Solving linear equations.		
Proportion (Recipes), Best buy problems, Exchange rates, Averages and Range and Stem and Leaf diagrams.		
Plotting linear graphs, Nth term of a linear sequence, Forming and solving equations and Solving linear equations.		
Proportion (Recipes), Best buy problems, Exchange rates, Averages and Range and Stem and Leaf diagrams.		
Plotting linear graphs, Nth term of a linear sequence, Forming and solving equations and Solving linear equations.		
Proportion (Recipes), Best buy problems, Exchange rates, Averages and Range and Stem and Leaf diagrams.		
Plotting linear graphs, Nth term of a linear sequence, Forming and solving equations and Solving linear equations.		
Proportion (Recipes), Best buy problems, Exchange rates, Averages and Range and Stem and Leaf diagrams.		
Plotting linear graphs, Nth term of a linear sequence, Forming and solving equations and Solving linear equations.		
Proportion (Recipes), Best buy problems, Exchange rates, Averages and Range and Stem and Leaf diagrams.		
Plotting linear graphs, Nth term of a linear sequence, Forming and solving equations and Solving linear equations.		