

PiXL Independence:

Mathematics – Student Booklet

KS4 FOUNDATION

Topic 2 – Powers and Roots. Factors and Multiples. Ratio/ Proportion

Contents:

- I. Basic Skills Check.
- II. Short Exam Questions.
- III. Further Practice.
- IV. Investigations.
- V. Academic Stretch.



I. Basic Skills Check

Answer the following questions. In order to improve your basic arithmetic you should attempt these without a calculator.

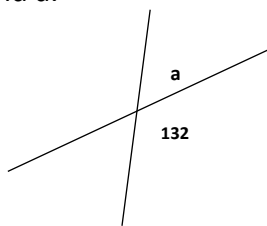
Skills Check 1

1. What is the product of 13 and 21?
2. The price of a 4 pack of beans is reduced by 15%, the original price was £1.60. What is the new price?
3. Write down three factors of 20.
4. Which of these numbers are prime?
3, 5, 6, 8, 12

5. Simplify $7J + 9k - 3k + 4J$

6. Solve: $5x - 3 = 12$

7. Find a.



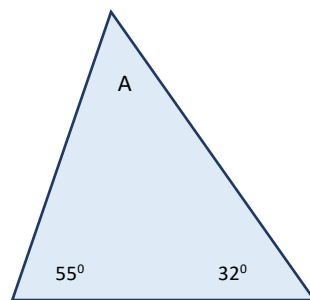
8. In a class of 30 students $\frac{1}{6}$ th of the class are left handed. How many are left handed?
9. Expand the bracket $5(a-8)$.
10. In a quadrilateral the angles are 132° , 42° , 110° and A. Find the value of A.



Skills Check 2

1. An electricity bill is £87 plus VAT at 5%. Calculate the VAT charged.
2. A bunch of flowers priced at £12, is reduced by a quarter. What is the new price?
3. Write down all the factors of 48.
4. Round 7850 to one significant figure.
5. Simplify $3x + 4y + 2x - 5y$.
6. Solve: $p + 6 = -4$.

7. Find A.



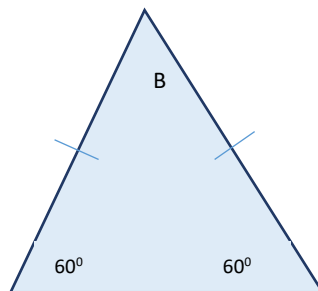
8. In a class of 24 students the probability that a pupil has brown eyes is $\frac{1}{6}$. How many students do not have brown eyes?
9. Expand and simplify $3(a+4) + 2(a-3)$.
10. Find the next two terms in the sequence; 5, 7, 9, 11,



Skills Check 3

1. A coat costs £65, delivery costs a further 5%. What is the delivery charge?
2. A train ticket that costs £126 is reduced by a $\frac{1}{3}$. What is the new cost?
3. Find all factors of 40
4. Round 1.3152 to two significant figures
5. Expand $3(7x - 5)$.
6. Solve: $3x - 5 = 13$

7. Find B.



8. In a packet of 20 sweets 6 are red. You take a sweet without looking; what is the probability of choosing a red sweet?
9. Calculate $\frac{2}{5} + \frac{1}{4}$.
10. Find the next two terms in the sequence; 22, 27, 32, 37,.....



II. Short Exam Questions

Section 1 - Powers and Roots

1. Work out 3.7^2 .
2. Work out the cube of 4.
3. Work out $3 \div 0.7^2$ Write down the full calculator display.
4. Use your calculator to work out $\sqrt{\frac{39231}{27.9^2}}$
Write down the full calculator display.
5. Use the x^y button on your calculator to work out:
a) 13^3 b) 10^0 c) 8^{-1}
6. Use your calculator to find the values of
 - (a) $\frac{4.75}{3.21 \times 5.76}$. Write down all the figures on your calculator.
 - (b) $\sqrt{10 - \pi}$
 - (i) Write down all the figures on your calculator.
 - (ii) Give your answer to 3 significant figures.
7. Calculate $3.2^2 \times 2.4^3$
Give your answer to 2 dp
8. Evaluate the following.
 - a) $2^3 \times 5^2$ b) $4^2 + 5^3$
9. Write the following in index form:
 - a) $5 \times 5 \times 5 \times 5$ b) $3 \times 3 \times 3 \times 7 \times 7$



Section 2 – Factors and Multiples

1. Write down all the factors of 24.
2. Explain why 73 is not a multiple of 3.
3. Write down all the common factors of 16 and 36.
4. Write down the 4th prime number
5. Find the even factors of 28
6. From the following list of numbers, write down
12, 14, 16, 17, 27
 - a) A multiple of 7
 - b) a factor of 24
 - c) a prime number
7. Write 72 as a product of prime factors
8. Write down all multiples of 7 between 50 and 80
9. Write down a factor of 100 which is also a square number
10. A number is less than 30, has 8 as a factor and is a multiple of 6. What is the number?

Section 3 - Ratio

1. Simplify the following ratios:

3:9	4:48	3:27	5:125
2:14	3:81	2:6:18	4:14:8
2. Simplify the following ratios:
20cm:0.5m 35p: £1.50 500g:1.5kg 30mm:7cm
3. A school collected £180 for charity. The money was divided between NSPCC and RSPCA in the ratio 2:3. How much did each charity receive?



4. Pocket money is split between Pete, Alan and Helen in the ratio 4:5:6. Dad pays out £60. How much does each person get?
5. Mr Allen, Mrs Book and Ms Collins own 3, 4 and 5 parts of a publishing business. They make £120 profit each week. How much do they each receive?
5. Divide £5 between Bill, Sue and Lucy in the ratio 2:3:5. How much does each person get? How much more than the others does Lucy receive?
6. 5 orange drinks cost £6.00. What is the cost of 10 orange drinks?
7. There are 3 feet in 1 yard. How many feet are in 5 yards?
8. A recipe for 'flan de naranja' serves 4 and uses:
 - 275g caster sugar
 - 200ml orange juice
 - 7 egg yolks

I am planning a party for 10 people. How much orange juice will I need to buy?

Section 4 – Mixed Questions

1. Pete Finnegan works on Saturdays and is paid £33 for 6 hours. How much would he be paid for working 6 hours on Saturday and 4 hours on Sunday?
2. There are 16 pints in 2 gallons. How many pints are there in 5 gallons?
3. A 250g serving of breakfast cereal contains 450 Kcal. What is the number of Kcal in every 100g?
4. Andrew went on holiday and had £400 to change into euros (€). The exchange rate was £1 = €1.50. How many euros did he have to spend?



5. Using the fact that $1.6 \text{ km} = 1 \text{ mile}$:
- How many kilometres are there in 25 miles?
 - How many miles are there in 3200 km?
6. Asif scores 32 out of 40 in his Maths test and 81% in his English test.
In which test does he do better. Show your working.
7. The ratio of the length of a car to a lorry is 2:5.
The car has a length of 400cm.
- Express the length of the car as a percentage of the length of the lorry.
- Calculate the length of the lorry.
8. Three litres of diesel costs £2.82. What is the cost of 40 litres?
9. 300 grams of sweets cost £1.65. Find the cost of
- 100 grams of sweets.
 - 500 grams of sweets.
 - 5 kg of sweets.
- Why might your answer to (c) be unrealistic?
10. a) Elana is paid £12.50 per hour. She is given a pay rise of 20%. What is her new pay rate?
- b) Six months later, due to adverse economic conditions Elana is asked to take a 20% pay *cut*.
What will be her hourly rate now?



III. Further Practice

1. Match the correct people using the information given. Check your answer at the end.

<https://justmaths.co.uk/Worksheets/Number/Factors%20multiples%20and%20primes%20-%20WORKSHEET.pdf>

<https://justmaths.co.uk/Worksheets/Number/Factors%20multiples%20and%20primes%20-%20ANSWERS.pdf>

2. Look at the worked example from a previous exam paper. Then use the traffic light questions to see where you are.

<https://justmaths.co.uk/Worksheets/Algebra/Laws%20of%20Indices%20-%20Mar%202013%20Non%20Calc%20-%20Q9%20-%20Wsheets.pdf>

CONNECT 4. Print off the sheet and play against another person (you can do this on your own if you don't have a partner)

<https://justmaths.co.uk/ratio-proportion/>

<https://justmaths.co.uk/Worksheets/Number/Fractional%20and%20negative%20indices%20-%20connect%204.pdf>

3. **Read the information carefully.** Has the bill been calculated correctly? If not, what should it be? What mistakes have they made? You should write a letter of complaint to the garage explaining what they have miscalculated.

<https://justmaths.co.uk/Worksheets/Number/Functional%20Skills%20-%20GARAGE%20PRICING%20TASK.pdf>

4. **Ratio hunt.** Download the PDF document and attempt the challenge.

<https://www.teachmathematics.net/page/18949/equivalent-ratio-hunt>



5. **Follow the 'revise, activity, test'.** For each of the three topics the links to the 'revise' part are below. You might want to take screen shots, or make notes as you go to demonstrate how you have got on. Then carry out the activity and the test. Record your score, or try and improve.

<http://www.bbc.co.uk/schools/gcsebitesize/maths/number/ratiosrev1.shtml>

<http://www.bbc.co.uk/schools/gcsebitesize/maths/number/primefactorsrev1.shtml>

<http://www.bbc.co.uk/schools/gcsebitesize/maths/number/primefactorsrev1.shtml>

6. **Exam style practice.** For each of the three topics you should watch the video, then answer the exam questions and mark your answers. Where have you made mistakes? Is there something you need to do more work on?

Powers

<http://www.mathsgenie.co.uk/squares-cubes-and-roots.html>

http://www.mathsgenie.co.uk/resources/6_powers-and-squareroots.pdf

http://www.mathsgenie.co.uk/resources/6_powers-and-squarerootsans.pdf

Ratio

<http://www.mathsgenie.co.uk/ratio.html>

http://www.mathsgenie.co.uk/resources/28_ratio.pdf

http://www.mathsgenie.co.uk/resources/28_ratioans.pdf

HCF/LCM

<http://www.mathsgenie.co.uk/HCFLCM.html>

http://www.mathsgenie.co.uk/resources/52_hcf-lcm-product-of-primes.pdf

http://www.mathsgenie.co.uk/resources/52_hcf-lcm-product-of-primesans.pdf

7. **Watch the video and make notes on the questions.**

<https://corbettmaths.com/2012/08/20/powers-indices/>

8. **Answer all the questions, keep creating a new worksheet until you get full marks.**

<https://corbettmaths.com/2012/08/20/powers-indices/>



IV. Investigations

For each of the following you should carry out the investigations then read the notes. You need to keep a detailed summary of what methods/approaches you have tried and what you then changed each time.

1. Pick one of the investigations in the booklet and answer the questions. In order to gain full credit you need to extend your investigation further.

<http://social.ocr.org.uk/files/ocr/Maths%20investigations.pdf>

2. NRICH activities. Follow the instructions, can you extend your thinking further? Follow some of the links? Keep notes of what you are doing at each stage. Some of the puzzles have links for you to follow to extend or enrich your understanding. If you do follow the links and carry out any further tasks, make sure you keep detailed notes so you can gain extra credit!

<https://nrich.maths.org/6745>

<https://nrich.maths.org/5759>

<https://nrich.maths.org/11638>

<https://nrich.maths.org/7132>

3. Exploring maths. Can you find a strategy to win the games? Write a report on how to win for each of the games.

<https://wild.maths.org/got-it>

<https://wild.maths.org/approaching-midnight>

<https://wild.maths.org/seven-counters>



V. Academic Reading

Maths in the real world.

For each video or article, you should make notes and questions you would like answering to extend your understanding and knowledge of maths in the real world.

1. Follow the **'WATCH, THINK, DIG DEEPER, DISCUSS'**
The Rubix Cube.

<https://ed.ted.com/featured/VvOg8aiS>

2. Follow the **'WATCH, THINK, DIG DEEPER, DISCUSS'**
Can you find the next number?

<https://ed.ted.com/lessons/can-you-find-the-next-number-in-this-sequence-alex-gendler>

3. Follow the **'WATCH, THINK, DIG DEEPER, DISCUSS'**
Cake!

<https://ed.ted.com/featured/KTil2Gft>

4. Read the following article, can you produce a poster, or presentation using this article.
Should maths be taught to all students until they are 18? What do you think? Can you research arguments for and against?

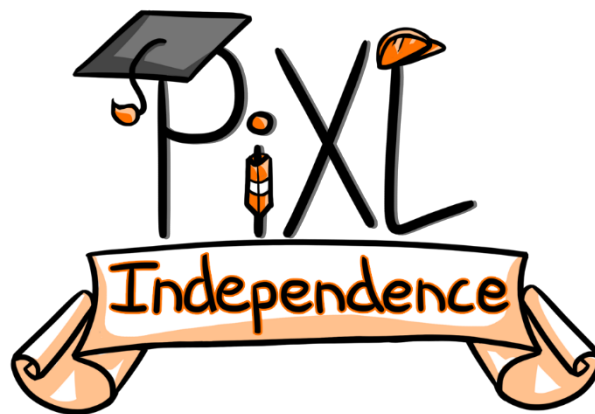
<https://www.theguardian.com/commentisfree/2012/jul/25/compulsory-maths-lessons-until-18>

<https://sfh10.wordpress.com/2010/10/25/should-maths-in-secondary-schools-be-compulsory/>

5. **Mental multiplication tricks.**

Watch the video then design instructions to explain how these methods work.

<https://www.youtube.com/watch?v=30X37X1uk2o>



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