



# **PiXL Independence:**

## **Mathematics - Student Booklet**

### **KS4 INTERMEDIATE**

#### **Topic 1 – Decimals, Best Buys and Standard Form**

##### **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 where possible.

### Skills Check 1

1. A phone is reduced by 30% to a price of £120. Calculate the original cost of the system.



2. What is  $\frac{2}{3}$  of £240?

3. Write 48 as a product of its prime factors.

4. Factorise  $x^2 - 2x - 35$ .

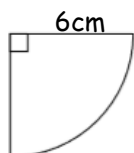
5. Write 210,000,000 in standard form.

6. Solve:  $2x + 7 \leq -1$ .

7. Use prime factors to find the lowest common multiple of 270 and 84.

8. List the first 5 terms of the sequence  $8n + 2$ .

9. Find the total perimeter of the shape shown, correct to one decimal place.

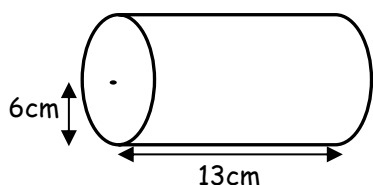


10. Calculate  $(4.85 \times 10^{25}) \div (1.7 \times 10^{19})$ , giving your answer in standard form correct to **two** significant figures.



## Skills Check 2

1. A year ago Peter was 162 cm. He is now 3% taller. How tall is Peter now?
2. Calculate  $(2.1 \times 10^{12}) \times (6.4 \times 10^{13})$ , giving your answer in standard form correct to two significant figures.
3. Write 40 as a product of prime factors.
4. Factorise  $x^2 - 20x + 75$ .
5. Write 0.000000652 in standard form.
6. Solve:  $5 \leq 6 - 3x$ .
7. Calculate the volume of a cylinder with radius 6cm and length 13cm. Give your **final** answer to one decimal place.



8. Find the  $n$ th term of the sequence: 15, 13, 11, 9,.....
9. Find the reciprocal of the number 3.5, giving your answer as a fraction.
10. A class of 14 boys and 18 girls take a test. The mean mark for the boys is 68%, and the mean mark for the girls is 84%. Calculate the mean mark for the whole class.

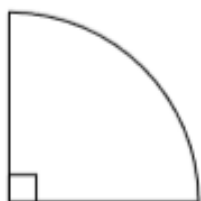


## Skills Check 3

1. A shopkeeper buys small scooters at £32. She sells the bikes making 15% profit. Calculate the selling price of the scooters.



2. George uses  $\frac{3}{4}$  of a tin of dog food each day. How many tins does he use in 5 days?
3. Find the HCF of 21 and 56.
4. Factorise  $x^2 + x - 12$ .
5. Write 0.00000004025 in standard form.
6. Solve:  $3x + 7 \geq 5x - 2$ .
7. Find the total perimeter of the shape shown, correct to one decimal place.



5mm

8. Find the  $n$ th term of the sequence: 2, 8, 14, 20,....
9. Write 2520 as a product of prime factors in index form
10. A class of 12 boys and 18 girls take a test. The mean mark for the class is 70%. If the mean mark for the boys is 61%, find the mean mark for the girls.

## II. Short Exam Questions



### Section 1 Best Value & Exchange Rates

For each question you should attempt to carry out an estimation first.

1. Apples cost £1 for a 1.4 kg bag at Tesco. The same type of apples cost 87p for a 750g bag at ASDA. Where are the apples better value for money? You must show your working.
2. A pack of 9 kitchen rolls costs £4.19. A pack of 4 kitchen rolls costs £1.76. Which pack gives the better value for money? You must show all your working.
3. The exchange rate in London is £1 = €1.17. The exchange rate in Paris is €1 = £0.76. Janet wants to change some pounds into euros. In which of these cities would Janet get the most euros? You must show all your working.
4. Ann went to France. She changed £400 into Euros (€). The exchange rate was £1 = €1.34.
  - (a) How many euros did she get?
  - (b) Ann went shopping in France. She bought: 2 scarves for €3.40 each, 1 necklace for €16.40, 1 bag for €10.50. The exchange rate was £1 = €1.34.

**Work out her total bill in pounds (£).**

5. Sara is going to print 120 photos.  
Here is some information about the cost of printing in two shops.

**PHOTOBOX 15 prints £2.99.**

**DIGITAL WORLD 10 prints £3.49, buy one pack get one free.**

Sara wants to buy the photos as cheaply as possible.

Which shop should Sara buy the 120 photos from?

You must show how you get your answer.

### Section 2 - BIDMAS

1. Use 'BIDMAS' to find the value of these:

a)  $3 + 4 \times 6$                       b)  $11 - 3 \times 2 + 5$

c)  $(2^4 - 7) + (17 - 3^2)$

d)  $\frac{7+11}{9}$                                   e)  $\frac{27-11}{9-7}$



2. Explain fully how you would use a mental method to find:  
a)  $7 \times 0.2$                       b)  $6 \div 0.2$   
c)  $40 \times 0.025$                     d)  $3.6 \div 0.06$
  
3. Show all your working when solving these.  
DO NOT USE A CALCULATOR.  
a)  $23.4 + 12.12$                   b)  $103.3 - 56.1$   
c)  $34 - 19.8$                       d)  $12.5 \times 7$   
e)  $47.2 \times 1.6$                     f)  $42 \div 0.7$
  
4. Use LONG DIVISION to work this out.  
DO NOT USE A CALCULATOR.  
 **$59.13 \div 2.7$**
  
5. Put brackets into the following expressions so that the answer is the number written in brackets.  
e.g.                   $5 + 6 - 2$                       (9)  
Answer:             $5 + (6 - 2) = 9$   
  
a)  $2 + 3 \times 4 - 1$                       (19)  
b)  $2 + 3^2 \times 4 + 3$                     (65)  
c)  $40 \div 10 \div 2$                       (8)  
d)  $15.7 + 1.3 \times 8.7 + 1.3$             (170)
  
6. Calculate the cost of 22.45kg of Strontium2007 at a cost of £176.52 per kg.  
Give your answer to a sensible degree of accuracy.
  
7. A bird travels 88.2 m in 12.6 seconds.  
Calculate its average speed.
  
8. James sells 6 cakes for £5. Maddie sells 4 cakes for £3.50. Which is better value?

### **Section 3 - Standard Form & best buys**

1. Use prime factors to find the HCF and LCM of 504 and 216.
  
2. Use your calculator to find each of these. Give answers in standard form to 3 significant figures:  
a.  $(3.85 \times 10^{13}) \times (1.63 \times 10^{11})$



b.  $\sqrt{6.53 \times 10^{-7}}$

3. Without a calculator, and showing your working, find each of these in standard form:

a.  $(9.2 \times 10^{20}) \times (2 \times 10^{30})$

b.  $(3 \times 10^{13}) \div (5 \times 10^{-17})$

4. Assuming that the Earth's orbit round the Sun is approximately a circle of radius  $1.50 \times 10^{11}$  metres, and that it orbits the Sun in exactly one year, find its speed in metres per second.

Give your answer in standard form to 3 significant figures.

5. A pollen grain has a mass of  $3.5 \times 10^{-4}$  grams. Find the number of grains in 1kg of pollen. Write your answer in standard form to **two** significant figures.

6. Use your calculator to work these out. Give your answers in standard form to three significant figures.

a.  $(3.82 \times 10^{23}) \div (5.1 \times 10^{-12})$

b.  $\sqrt{1.8 \times 10^{37}}$

c.  $(2.4 \times 10^{-5}) + (1.29 \times 10^{-6})$

d. The **reciprocal** of  $6.5 \times 10^{-5}$ .

7. Which is better value? 250ml for £6.20 or 400ml for £8.30

8. Which is the best buy?

Sure deodorant 250ml, 2 for £4

Gillette deodorant 200ml, 3 for 2 (£2.33 each)

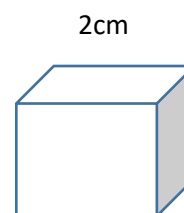
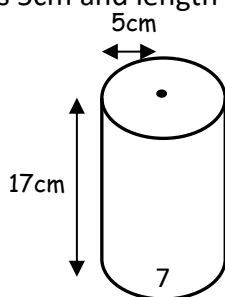
#### **Section 4 - Mixed Questions**

1. A one ounce measure of poppy seeds contains approximately  $1.4 \times 10^5$  seeds.

Given that one ounce is equal to 28.3 g, work out how many poppy seeds would be in a 1 kg measure of seeds.

Give your answer in standard form correct to 2 significant figures.

2. A solid metal cylinder of radius 5cm and length 17cm is melted down and made into cubes of length 2cm.





Assuming that none of the metal is lost in the process, work out how many whole cubes can be made.

3. Gary needs at least 1200 Euros to go on a trip to France. When he goes to the bank, he finds the lowest Euro note he can get is a 10€ note.  
Given that the exchange rate is £1 = 1.16€, find the least amount of Euros Gary must buy in order to have at least £1200 worth and how much he paid for them.
4. Showing all your working, estimate the value of  $0.287 \times 0.513$ .
5. Tom wants to buy 10 calculators. He has 2 options:  
Option 1: £5.99 each and a 20% discount  
Option 2: £7.00 each and buy 2 get one free.  
Which is the cheapest option?
6. A restaurant bill of 187.43 is to be shared equally between 7 people. How much should each person pay? Give your answer to the nearest pound.
7. Which of these numbers is NOT written in standard form?  
a)  $7 \times 10^{-5}$     b)  $7.3^4$     c)  $48.4 \times 10^6$     d)  $5.93 \times 10$





### III. Further Practice

1. Can you solve the murder?  
<https://justmaths.co.uk/Worksheets/Number/AA%20NEW%20-%20Estimating%20to%201%20sigfig%20-%20Whodunnit.pdf>  
<https://justmaths.co.uk/Worksheets/Number/Bidmas%20-%20Whodunnit.pdf>
2. Watch and make notes, answer any questions as you go.  
<https://www.youtube.com/watch?v=0W0C3KQDyVg>
3. Read the information and try to answer the questions. Can you think how you might extend this investigation further?  
<https://justmaths.co.uk/Worksheets/Number/Functional%20Skills%20-%20EXCHANGE%20RATES.pdf>
4. Follow the 'revise, activity, test'.  
<http://www.bbc.co.uk/schools/gcsebitesize/maths/number/roundestimaterev1.shtml>
5. Answer the exam questions. Then mark your answers.  
[http://www.mathsgenie.co.uk/resources/82\\_standard-form.pdf](http://www.mathsgenie.co.uk/resources/82_standard-form.pdf)  
[http://www.mathsgenie.co.uk/resources/82\\_standard-formans.pdf](http://www.mathsgenie.co.uk/resources/82_standard-formans.pdf)
6. Watch the revision video then answer the questions and mark your answers.  
<http://www.mathsgenie.co.uk/bounds.html>  
[http://www.mathsgenie.co.uk/resources/97\\_upper-and-lower-bounds.pdf](http://www.mathsgenie.co.uk/resources/97_upper-and-lower-bounds.pdf)  
[http://www.mathsgenie.co.uk/resources/97\\_upper-and-lower-boundsans.pdf](http://www.mathsgenie.co.uk/resources/97_upper-and-lower-boundsans.pdf)
7. Watch the video, then answer all the exam questions and mark your answers.  
[https://www.youtube.com/watch?v=75KeV8\\_vlFs](https://www.youtube.com/watch?v=75KeV8_vlFs)



## 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. Explain at each stage the decisions you have made and any changes in your approach. Your investigation will need a detailed summary.

<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.

<https://nrich.maths.org/13325>

<https://nrich.maths.org/7024>

<https://nrich.maths.org/746>

3. Exploring maths.

<https://nrich.maths.org/7016>

<https://wild.maths.org/spirals-spirals>

<https://wild.maths.org/quarters-quarters>

4. **Can you find a sequence of consecutive integers that add up to 1000?** Try this investigation first, then read the following solution and make notes on the methods. What would you do differently? What did you change each time?

<https://ibmathsresources.com/2015/04/10/arithmatic-sequences-puzzle/>

5. **Investigate what makes numbers happy, or sad.**

<https://ibmathsresources.com/2014/06/19/friendly-numbers-solitary-numbers-perfect-numbers/>

<https://nrich.maths.org/1314/index>



## 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'**

**Where do maths symbols come from?**

<https://ed.ted.com/lessons/where-do-math-symbols-come-from-john-david-walters>

**2. Follow the 'WATCH, THINK, DIG DEEPER, DISCUSS'**

**Banned numbers.**

<https://ed.ted.com/lessons/a-brief-history-of-banned-numbers-alessandra-king>

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

**Maths anxiety.**

<https://ed.ted.com/lessons/why-do-people-get-so-anxious-about-math-orly-rubinsten>

**4. Read the following article, can you produce a poster, or presentation using this article?  
Can you research any of these elements further?**

<https://www.theguardian.com/science/2012/jan/23/how-learn-love-maths>

**5. Japanese Multiplication.**

Watch the video then design instructions to explain how this works.

[https://www.youtube.com/watch?time\\_continue=94&v=85Vd0NpL32k](https://www.youtube.com/watch?time_continue=94&v=85Vd0NpL32k)

**6. Pick one subject from the list and follow the materials and questions to extend your understanding about mathematics in other subjects.**

<https://integralmaths.org/course/view.php?id=166>

**7. Read one of the articles from the link and make detailed notes about how standard form is used.**

<http://www.jodrellbank.manchester.ac.uk/>



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