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For Ages 11 - 12

Everyday Maths Book 3

Mathematics problems
set in a real world
context.

Written by Jane Bourke. Illustrated by Rod Jefferson.

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ARCHIMEDES IN THE POOL

Archimedes has a pool in his garden. It has been raining all day and the pool is full to the brim. The rectangular pool measures 4 m long and 2.5 m wide. It is 3.75 m deep in all areas of the pool because Archimedes once dived in the shallow end and created a huge hole! Since then it has been levelled out to 3.75 m.

1. What is the total capacity of the pool?

Volume, Capacity and Mass are related. Look at the table below:

Capacity (millilitres)	Volume (cubic centimetres)	Mass (grams)
1 mL	1 cm ³	1 g
10 mL	10 cm ³	10 g
100 mL	100 cm ³	100 g
200 mL	200 cm ³	200 g
500 mL	500 cm ³	500 g
1 L	1000 cm ³	1 kg

2. Archimedes needs to chlorinate the pool every week. He uses a litre of chlorine for every 15 cubic metres of water. How much chlorine does Archimedes need each week?

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Archimedes has seen the following specials in Galileo's Gazette:



3. How much chlorine does Archimedes need for one year?

4. Which offer should Archimedes take if he puts the same amount of chlorine in his pool all year round?

5. Will he have any chlorine left over?

Challenge:

If three hours ago it was as long after one o'clock in the morning as it was before one o'clock in the afternoon, what time would it be now?

Name: _____

ARCHIMEDES' POOL CHALLENGE

Archimedes had a measure on the side of his pool to let him know when the water levels rose and fell. One day the water level was right on the line. Archimedes hopped in and noticed that the level rose above the line. Using a marker he drew a line at the new level.

When he hopped out he noticed the level returned back to the normal mark.

Archimedes wanted to know if the level the water rose had anything to do with his weight.

Using the hose, he filled the pool up to the exact level it reached when he jumped in.

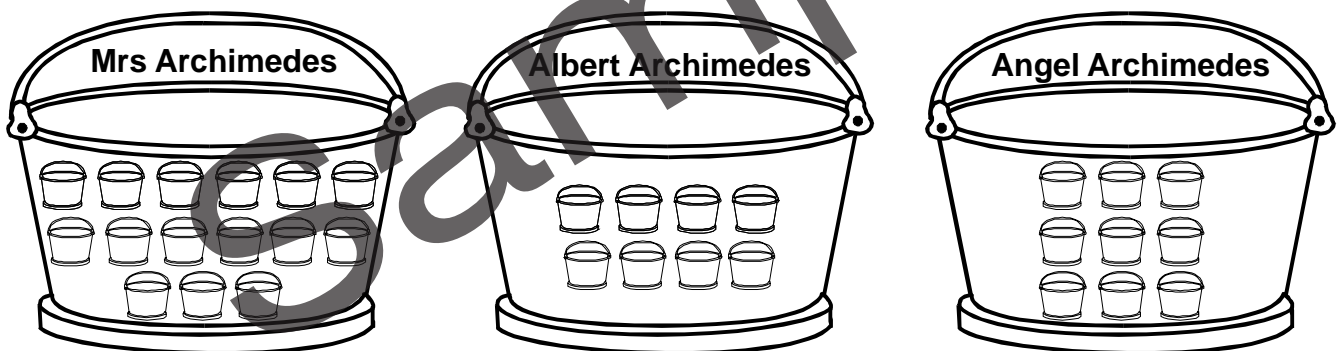
He decided to measure the amount of water he had added by removing it in bucket loads and counting the buckets. He knew that each bucket held 6 litres.

1. Archimedes weighs 138 kilos. How many bucket loads will he need to remove to return the water level to the normal mark?

.....

2. Archimedes' family thought he was crazy. He told Mrs Archimedes he could guess how much she weighed if she hopped in the pool and did not splash around too much. Archimedes measured the levels again and used the bucket to work out how much water was displaced.

How much does each person weigh if Archimedes removed the following bucket loads?



2a.

2b.

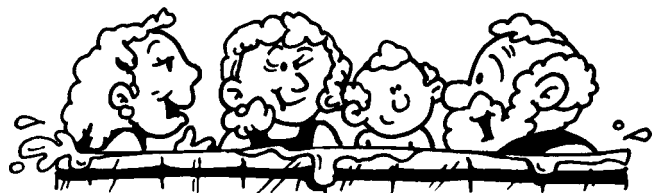
2c.

The whole family, including Archimedes, then got into the pool and Archimedes marked the levels again. This time Aunty Agnes got in and she weighed 72 kilos.

Later on when they were out of the pool, Archimedes looked at the two different levels and said, "I know exactly how many buckets of water are needed to make the water level rise to the mark I made!"

3. How many buckets are needed?

Hint: Don't forget Aunty Agnes!



Challenge:

A worm is at the bottom of a twenty metre well. It can crawl upwards at the rate of four metres a day but at night it always slips back three metres. At this rate how long will it take before the worm can crawl out of the well?

Name: _____

GALILEO'S USED CAR YARD

Galileo has six cars in his yard and each one has a different reading on the odometer. He has decided to pose a problem and give away his shiny yellow Porsche to anyone who can solve his puzzle.

The puzzle is to work out the exact number of kilometres that each car has driven. Galileo has provided the following clues:

1. The old green convertible has driven more than 200,000 km and less than 300,000 km. Only two digits appear on the odometer and the numbers in the thousand, ten thousands and hundred thousands place each equal half the value of the digits in the ones, tens and hundreds place.
2. The blue Volkswagen's odometer shows approximately $\frac{1}{3}$ of the amount of the green convertible. The five digits on the odometer form a palindrome. This means that the number reads the same from front or back, such as 53435 or 2332.
3. The orange van has nearly 24,850 more kilometres on it than the VW. The number contains only two digits which form a repeating pattern. There are no 7's in the number.
4. The purple truck has as many kilometres as the orange van and the VW combined.
5. The white Ferrari has only 25% of the amount of the purple truck.
6. The newest car on Galileo's yard, a black Mustang, has done only 21,642 kilometres. This is exactly half of what the Ferrari has done.

Can you solve the puzzle?

Write the odometer readings for each of the cars:

Convertible:

--	--	--	--	--	--

Volkswagen:

--	--	--	--	--	--

Van:

--	--	--	--	--	--

Truck:

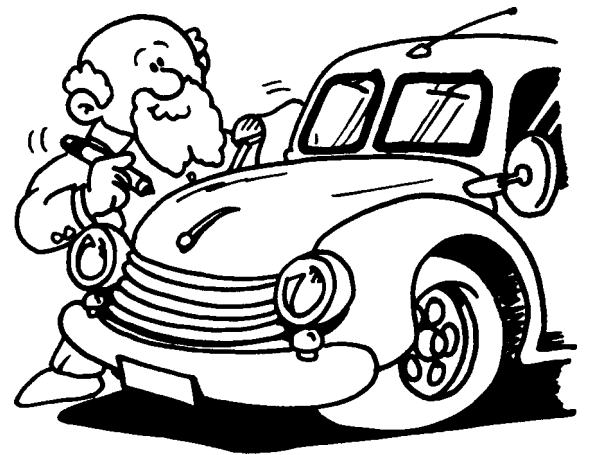
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Ferrari:

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Mustang:

--	--	--	--	--	--



Challenge:

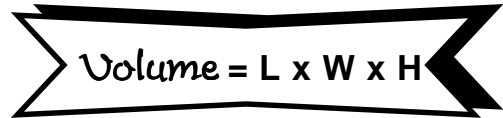
Galileo has another car yard where Smooth the super sales representative is employed. Smooth sold three cars in his first week on the job. The second week saw him sell 9, with sales of 18 in the third week and 30 in the fourth week. If Smooth continues at this rate, for how many number of weeks will he have been working when he sells 84 cars in one week?

Name: _____

Pythagoras' Packages 1

Pythagoras' Delivery Service is flourishing. He has worked out that exactly 200 deliveries have been made in the last 4 days. His delivery truck container has the following dimensions:

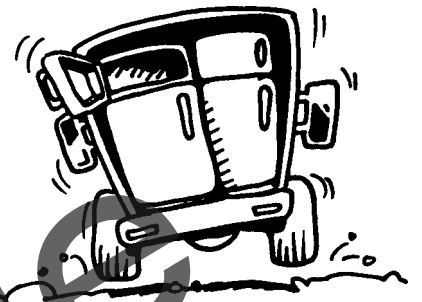
Length = 5 m, Height = 4 m, Width = 2.5 m.



$Volume = L \times W \times H$

1. What is the capacity of the storage area?

2. On Monday he delivered 20 deluxe fridges. There was no room left to fit in anything else and the fridges were identical. Based on what you know about the capacity of Pythagoras' truck, calculate the volume of one of the fridges.



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3. On Tuesday Pythagoras was asked to help Archimedes move some boxes and furniture to one of Galileo's new buildings. Archimedes had four large boxes with the following dimensions:

Box 1: Length = 2.5 m, Width = 80 cm, Height = 1.5 m $V =$

Box 2: Length = 90 cm, Width = 75 cm, Height = 75 cm $V =$

Box 3: Length = 1.5 m, Width = 1.5 m, Height = 1 m $V =$

Box 4: Length = 60 cm, Width = 60 cm, Height = 60 cm $V =$

Calculate the volume of each box.

4. How much room was left in Pythagoras' truck?

5. Was he able to fit in ten solid jarrah storage trunks that are 2.5 m tall, 3 m wide and 50 cm long?

Challenge: Taxi Trick?

Pythagoras, Galileo and Archimedes take a taxi to the city. When they reach the Town Hall the meter reads \$25. Each man hands over a \$10 note. The driver gives back five \$1 coins as change. Each man takes one of the dollar coins and they leave the remaining two \$1 coins for the driver as a tip.

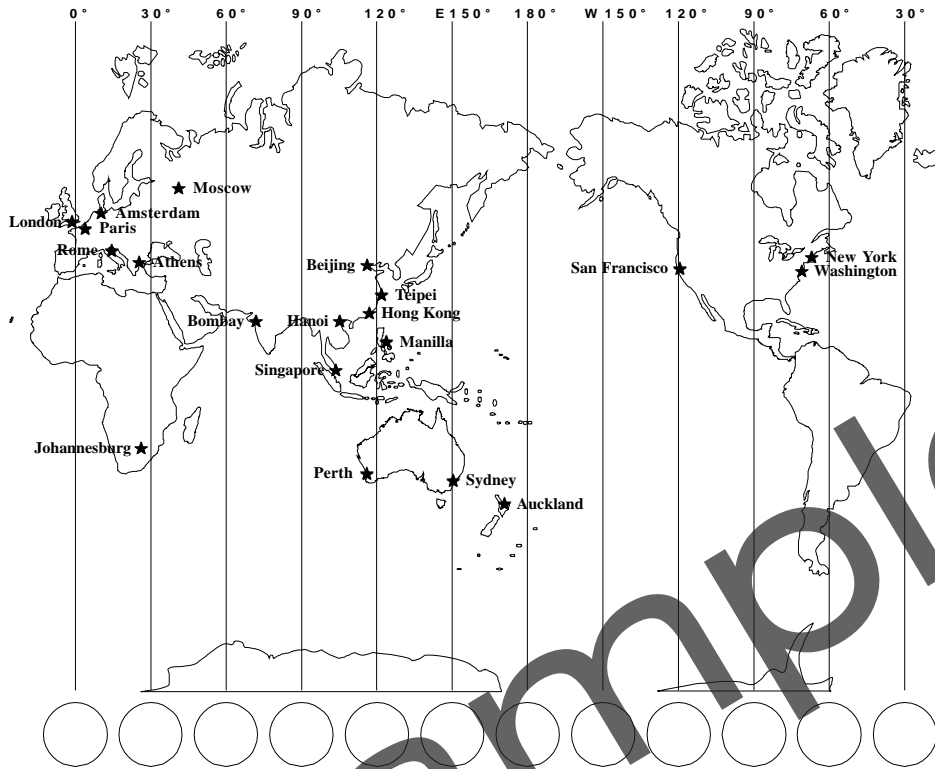
Each man has spent \$9 making a total of \$27 spent between the three. The driver has two dollars bringing the total up to \$29. Explain what happened to the other dollar.



Name: _____

ARCHIMEDES PHONES HOME

Archimedes is well into his tour of the world and wants to let everybody know what an exciting time he is having. Use the world times on the map below to help check Archimedes' calls. (*Hint: Use pencil in the circles so that you can change the GMT for different questions*).



Did you know?
 The earth is divided into 24 time zones. The base time zone is at 0° longitude and passes through the Royal Greenwich Observatory in England. Each zone spans 15° longitude although some borders are bent to fit in certain regions. The time is set according to Greenwich Mean Time (GMT).
N.B. On the map used on this page zones represent 2 hours.

1. When it is Noon GMT what is the time in: (*Use your atlas to locate some cities.*)

a. Honolulu	b. Vancouver	c. Rome
d. Sydney	e. Bangkok	f. London

2. When Archimedes arrived in Sydney at 6.10 am he wanted to ring his mother in Perth. He decided it would be best to wait until it was 8.30 am in Perth.
 What time would it have been in Sydney?

3. The next night when he stopped over in Honolulu, he gave his cousin in London a quick call to let him know he was on his way to Vancouver. He rang his cousin at 11.30 pm. What would the time have been in London?

4. Archimedes arrived in Vancouver at 8.50 am on Friday. He decided to ring his brother in New Zealand. What time and day would it have been?

5. When Archimedes arrived in Bangkok at 6.50 am, he remembered it was his friend Newton's birthday. Newton was holidaying in London so Archimedes rang him straight away. What time was it in London?

6. What time should Archimedes have waited till before he rang Newton?