

Beer, Barrels & Casks

Name _____ Date _____

Source: <http://www.churchendbrewery.co.uk/>



Church End Brewery started life in an old coffin workshop behind the Griffin Inn, Shustoke, Warwickshire. Its goal was to be a 'hands on' craft brewery making a wide range of cask conditioned beers. The Brewery philosophy only allows the use of good quality raw materials, such as floor malted barley and whole hops; definitely no processed sugars!

M-Reg was the first brew on August 1st 1994. They now have a range of over forty distinct products including fruit beers made with real fruit, herb beers made with fresh herbs, wheat beers made with a high proportion of malted wheat, black beers with chocolate malt, honey beers made with real honey, etc. etc.

The plant was constructed from mainly second hand stainless steel equipment, with an output capacity of four brewer's barrels per brew (36 gallons is a brewer's barrel). At that time, an average of five brews a week were made and everything that was brewed was sold.

Today, Church End Brewery is housed in a refurbished social club. During 2008 the brewing plant upgraded to 20 Barrels per brew. During the installation new greener refrigeration and gas burners were installed, and this has already led to a 25% reduction in the consumption of both.

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Questions

Show all your working out clearly.



The new brewing plant produces 20 Brewer's Barrels per brew.

Q1. How many gallons are there in 20 barrels?

After production, the beer is used to fill casks for distribution to pubs and other customers.

Q2. How many 9 gallon casks can be filled per brew?



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An Imperial gallon contains 8 pints.

Q3. If the brewery makes 4 brews per week, how many pints do they produce?

The staff at the Brewery work hard to reduce wastage of beer during production, so that they can improve business profits.

Q4. If they could reduce annual losses by 1%, how much beer would they save?

(Assume they work every week of the year).

Q5. Beer is sold to pubs at an average price of £1.40 per pint. By reducing annual losses by 1%, how much more profit would the brewery generate?



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Q6. The average price of the beer when sold by pubs is £3.40 per pint.

What percentage increase in price does this represent?

Q7. One type of cask used by the brewery is called a Tall Metal Pin, which has a cylindrical shape. **The radius of the cask is 12 cm and the height is 45 cm. Use the formula below to calculate how many litres of beer this cask holds.**

$$\text{Volume} = \pi \times \text{radius}^2 \times \text{height}$$

Q8. There are 4.456 Litres in an Imperial Gallon. **How many Gallons does the Tall Metal Pin cask hold?**



Tall metal pin

Calculating excise duty.

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Excise duty on beer is calculated by converting the bulk litres into hectolitres (one hectolitre equals one hundred litres) and multiplying by the ABV (alcohol by volume) figure declared. The current excise duty rate is then applied to this figure.

<http://www.hmrc.gov.uk/manuals/hmexshmanual/hmexsh5020.htm>

Example

Find the excise duty on 150 cases of beer each containing 24 bottles of 33cl 5% ABV.

Convert to bulk hectolitres:

$$24 \times 150 \times 0.33 = 1188 \text{ litres (33 cl = 0.33 litres)}$$

$$1188 \div 100 = 11.88 \text{ hl}$$

The bulk Hectolitre figure is multiplied by the declared ABV amount:

$$11.88 \times 5 = 59.4 \text{ hl \%ABV}$$

**The current duty rate on beer is £18.57.

Multiply the hl %ABV amount by the duty rate.

So, the duty on 150 cases is: $59.4 \times £18.57 = £1103.06$



** <http://www.hmrc.gov.uk/news/news-120911.htm>

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Extension Work – Excise Duty Calculations



Rugby Ale: A strong, deep red bitter. The use of several coloured malts ensures that rich complex malt flavours dominate. Made with a single English hop. 50cl **ABV:** % 5.0

Nun's Ale: Pale and triple hopped. 50cl **ABV:** % 4.5

Arthur's Wit: A pale, strong beer that is also a bitter. Has a slightly spicy hop finish. 33cl **ABV:** % 6.0

What Excise Duty is paid on the following sales?

500 cases of Rugby Ale, 12 x 50cl bottles

650 cases of Nun's Ale, 12 x 50cl bottles

425 cases of Arthur's Wit, 18 x 33cl bottles

FUNCTIONAL MATHEMATICS Coverage and Range statements (indicative only)		
<p>This resource is ideal for underpinning many Functional Maths coverage and range statements at Level 1 and Level 2 (see ticked areas of the table below). Coverage and range statements provide an indication of the type of mathematical content candidates are expected to apply in functional contexts. Relevant content can also be drawn from equivalent National Curriculum levels & Adult Numeracy standards. However, in Functional Maths exams it is the process skills that are assessed; these are key to successful Functional Maths teaching and learning and must always be developed and stressed during teaching (see below). Ofqual (2009), <i>Functional Skills criteria for Mathematics: Entry 1, Entry 2, Entry 3, level 1 and level 2.</i> http://www.ofqual.gov.uk/</p>		
Level 2		
<p>a) understand and use positive and negative numbers of any size in practical contexts</p> <p>b) carry out calculations with numbers of any size in practical contexts, to a given number of decimal places ✓</p> <p>c) understand, use and calculate ratio and proportion, including problems involving scale</p> <p>d) understand and use equivalences between fractions, decimals and percentages ✓</p> <p>e) understand and use simple formulae and equations involving one or two operations ✓</p> <p>f) recognise and use 2D representations of 3D objects</p>	<p>g) find area, perimeter and volume of common shapes ✓</p> <p>h) use, convert and calculate using metric and, where appropriate, imperial measures ✓</p> <p>i) collect and represent discrete and continuous data, using information and communication technology (ICT) where appropriate</p> <p>j) use and interpret statistical measures, tables and diagrams, for discrete and continuous data, using ICT where appropriate.</p> <p>k) use statistical methods to investigate situations</p> <p>l) use probability to assess the likelihood of an outcome</p>	
Level 1		
<p>a) understand and use whole numbers and understand negative numbers in practical contexts</p> <p>b) add, subtract, multiply and divide whole numbers using a range of strategies ✓</p> <p>c) understand and use equivalences between common fractions, decimals and percentages ✓</p> <p>d) add and subtract decimals up to two decimal places</p> <p>e) solve simple problems involving ratio, where one number is a multiple of the other</p> <p>f) use simple formulae expressed in words for one or two-step operations</p> <p>g) use data to assess the likelihood of an outcome</p>	<p>h) solve problems requiring calculation, with common measures, including money, time, length, weight, capacity & temperature ✓</p> <p>i) convert units of measure in the same system ✓</p> <p>j) work out areas and perimeters in practical situations</p> <p>k) construct geometric diagrams, models and shapes</p> <p>l) extract and interpret information from tables, diagrams, charts and graphs</p> <p>m) collect and record discrete data and organise and represent information in different ways</p> <p>n) find mean and range</p>	
Process Skills (all levels)		
Representing – selecting the mathematics and information to model a situation	Analysing – processing and using mathematics	Interpreting – interpreting and communicating the results of the analysis
Skill Standards (Level 2)		
<ul style="list-style-type: none"> understand routine and non-routine problems in familiar and unfamiliar contexts and situations ✓ identify the situation or problems and identify the mathematical methods needed to solve them ✓ choose from a range of mathematics to find solutions ✓ 	<ul style="list-style-type: none"> apply a range of mathematics to find solutions ✓ use appropriate checking procedures and evaluate their effectiveness at each stage 	<ul style="list-style-type: none"> interpret and communicate solutions to multistage practical problems in familiar and unfamiliar contexts and situations ✓ draw conclusions and provide mathematical justifications
Skill Standards (Level 1)		
<ul style="list-style-type: none"> understand practical problems in familiar and unfamiliar contexts and situations, some of which are non-routine ✓ identify and obtain necessary information to tackle the problem ✓ select mathematics in an organised way to find solutions ✓ 	<ul style="list-style-type: none"> apply mathematics in an organised way to find solutions to straightforward practical problems for different purposes ✓ use appropriate checking procedures at each stage 	<ul style="list-style-type: none"> interpret and communicate solutions to practical problems, drawing simple conclusions and giving explanations ✓