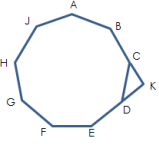
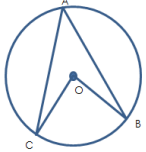
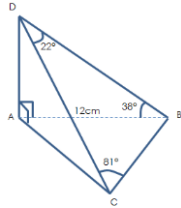
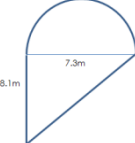
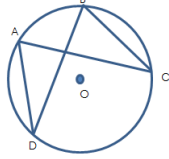
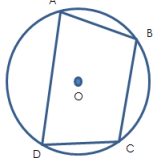

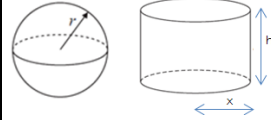


A BIT OF MATHS EACH DAY – HIGHER TIER – DECEMBER 2017

| MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY | SUNDAY | | | | | | | | | | | | |
|---|--|---|--|---|--|--|------------------|----|------------------|----|------------------|----|---|---|--|---|--|--|
| <h1 align="center">December</h1> | | <p>The best way to learn mathematics is to DO mathematics. If you do something regularly on a daily basis you will make a bigger difference than leaving it till just before your exams. If you need help there are some fantastic videos at www.corbettmaths.com Or you can always tweet me @mrchadburn</p> | | <p align="center">1st</p> <p>The weights of 60 people in kg are shown in the table.</p> <table border="1"> <thead> <tr> <th>Weight (w kg)</th> <th>Frequency</th> </tr> </thead> <tbody> <tr> <td>$30 < w \leq 40$</td> <td>2</td> </tr> <tr> <td>$40 < w \leq 50$</td> <td>11</td> </tr> <tr> <td>$50 < w \leq 60$</td> <td>26</td> </tr> <tr> <td>$60 < w \leq 70$</td> <td>18</td> </tr> <tr> <td>$70 < w \leq 80$</td> <td>3</td> </tr> </tbody> </table> <p>(a) Which group does the median lie in? (b) Estimate the mean weight, giving your answer to 2dp.</p> | Weight (w kg) | Frequency | $30 < w \leq 40$ | 2 | $40 < w \leq 50$ | 11 | $50 < w \leq 60$ | 26 | $60 < w \leq 70$ | 18 | $70 < w \leq 80$ | 3 | <p align="center">2nd</p> | <p align="center">3rd</p> <p>(a) Show that the equation $x^3 - 6x - 2 = 0$ has a solution between 2 and 3. (b) Show that the equation $x^3 - 6x - 2 = 0$ can be rearranged to give $x = \sqrt{6 + \frac{2}{x}}$ (c) Starting with $x_0 = 2.5$, use the iteration formula $x_{n+1} = \sqrt{6 + \frac{2}{x_n}}$ 3 times to find an estimate for the solution of equation $x^3 - 6x - 2 = 0$.</p> |
| | | | | Weight (w kg) | Frequency | | | | | | | | | | | | | |
| $30 < w \leq 40$ | 2 | | | | | | | | | | | | | | | | | |
| $40 < w \leq 50$ | 11 | | | | | | | | | | | | | | | | | |
| $50 < w \leq 60$ | 26 | | | | | | | | | | | | | | | | | |
| $60 < w \leq 70$ | 18 | | | | | | | | | | | | | | | | | |
| $70 < w \leq 80$ | 3 | | | | | | | | | | | | | | | | | |
| <p align="center">4th</p> <p>Frank thinks that $(x + 9)^2 = x^2 + 81$. Is Frank right? You must explain how you came by your answer.</p> | <p align="center">5th</p>  <p>ABCDEFGHK is a regular nonagon (9 sides). EDK and BCK are straight lines. Work out the size of angle CKD. You must show how you got your answer.</p> | <p align="center">6th</p> <p>The heights (in cm) of 15 boys in Y11 are 149, 150, 155, 161, 163, 165, 166, 171, 173, 177, 178, 180, 182, 182, 186. Draw a box and whisker diagram to illustrate this. 15 girls have a median of 168cm and an interquartile range of 10cm. Compare the heights of the boys and the girls.</p> | <p align="center">7th</p> <p>Without using a calculator, work out the answer to $\frac{2}{5} \div \frac{5}{6}$</p> | <p align="center">8th</p> <p>Prove that angle BOC is twice angle BAC.</p>  | <p align="center">9th</p>  <p>The diagram shows a pyramid with base ABC. AB = 12cm. Angle ABC = 38°, Angle BDC = 22° and angle BCD = 81°. Find the angle between the line CD and the plane ABC. Give your final answer correct to 1 decimal place.</p> | <p align="center">10th</p> | | | | | | | | | | | | |
| <p align="center">11th</p> <p>Tom, Ellen and Delia received £320. The ratio of the amount Tom gets to the amount Ellen gets is in the ratio 3 : 7. Tom gets £84 less than Ellen. What percentage of the total does Delia receive?</p> | <p align="center">12th</p> <p>The diagram shows the plan of a garden. It is to be filled with gravel. Gravel comes in bags costing £8.99 each, each bag covers approximately 4m². How much will it cost to gravel the whole garden?</p>  | <p align="center">13th</p> <p>A material is in the shape of a cuboid of dimensions 5cm by 11cm by 1.3m. The material weighs 8.6kg. It is designed to float in a liquid but only if its density is less than that of the liquid. In a large tank, 1 litre of the liquid weighs 1250g. Will the cuboid float? You must explain how you came by your answer.</p> | <p align="center">14th</p> <p>The population of the town of Swillsborough is reducing by x% each year. Given that its population decreased by a half in 12 years, find the value of x to 1 decimal place.</p> | <p align="center">15th</p> <p>Prove that angle DAC = angle DBC</p>  | <p align="center">16th</p> <p align="center">$z = \frac{\sqrt{x}}{y^2}$</p> <p>$x = 51.2$ correct to 1 decimal place. $y = 3.75$ correct to 2 decimal places. By considering the bounds of accuracy, work out the value of z to a suitable degree of accuracy, giving a reason for your answer.</p> | <p align="center">17th</p> | | | | | | | | | | | | |
| <p align="center">18th</p> <p>The time taken to complete a mathematics test by 60 students is shown in the table below. Display this information using a frequency polygon.</p> <table border="1"> <thead> <tr> <th>Height (t seconds)</th> <th>Frequency</th> </tr> </thead> <tbody> <tr> <td>$0 < t \leq 6$</td> <td>7</td> </tr> <tr> <td>$6 < t \leq 12$</td> <td>17</td> </tr> <tr> <td>$12 < t \leq 18$</td> <td>20</td> </tr> <tr> <td>$18 < t \leq 24$</td> <td>11</td> </tr> <tr> <td>$24 < t \leq 30$</td> <td>5</td> </tr> </tbody> </table> | Height (t seconds) | Frequency | $0 < t \leq 6$ | 7 | $6 < t \leq 12$ | 17 | $12 < t \leq 18$ | 20 | $18 < t \leq 24$ | 11 | $24 < t \leq 30$ | 5 | <p align="center">19th</p> <p>Wayne has two bags of counters. The first has 5 red and 3 white counters in it. The second has 8 red and 5 white counters in it. A counter is taken, at random, from each bag. Draw a tree diagram to illustrate this and work out the probability the counters are of different colours.</p> | <p align="center">20th</p> <p>Two jars are mathematically similar. Jar A has a height of 12cm. Jar B has a height of 16cm and a surface area of 240cm². What is the surface area of Jar A?</p> | <p align="center">21st</p> <p>Make x the subject in $y = \frac{3x + 5}{8 - 5x}$</p> | <p align="center">22nd</p> <p>Prove that the sum of angle ABC and angle ADC is 180°</p>  | <p align="center">23rd</p> <p>Simplify fully the fraction... $\frac{3x^2 - 22x - 16}{x^2 - 64}$</p> | <p align="center">24th</p> <p>The price of the train ticket from Sheffield to Penistone increased by £4.20. This represented a 7% increase. What was the price of the ticket before the increase?</p> |
| Height (t seconds) | Frequency | | | | | | | | | | | | | | | | | |
| $0 < t \leq 6$ | 7 | | | | | | | | | | | | | | | | | |
| $6 < t \leq 12$ | 17 | | | | | | | | | | | | | | | | | |
| $12 < t \leq 18$ | 20 | | | | | | | | | | | | | | | | | |
| $18 < t \leq 24$ | 11 | | | | | | | | | | | | | | | | | |
| $24 < t \leq 30$ | 5 | | | | | | | | | | | | | | | | | |
| <p align="center">25th</p>  <p>Merry Christmas! It's Christmas day – you deserve a day off!!</p> | <p align="center">26th</p> <p>Simplify the following expression as fully as possible... $\frac{4x^2y^4 \times (3xy^2)^2}{2x^2y \times 4xy^9}$</p> | <p align="center">27th</p> <p>Solve the equation $\frac{2x + 1}{3} - \frac{x}{5} = 2$</p> | <p align="center">28th</p> <p>(a) Show that the equation $3x = 5 + \frac{1}{x}$ Can be rearranged to $3x^2 - 5x - 1 = 0$. (b) Hence solve $3x = 5 + \frac{1}{x}$ giving your answers correct to 2 decimal places.</p> | <p align="center">29th</p> <p>$f(x) = 3x - 1$ and $g(x) = x^2 + 5$ (a) Find $g(-7)$ (b) Show that $fg(x) = 9x^2 - 6x + 6$ (c) Solve $fg(x) = gf(x)$ giving your answers correct to 2 decimal places.</p> | <p align="center">30th</p> <p>A sphere of radius r is to be melted down to produce 81 identical cylinders. The cylinders are to have a height three times their radius. The radius of each cylinder is to be x cm. Find an expression for the radius of the sphere, r, in terms of x in its simplest form.</p>  | <p align="center">31st</p> | | | | | | | | | | | | |