Math SL PROBLEM SET 27

Section A (Short Answer)

1. (**V4.1 - N**) (**CI**) Let $\mathbf{u} = \boldsymbol{i} + 3\boldsymbol{j} - 2\boldsymbol{k}$ and let $\mathbf{v} = 2\boldsymbol{i} + \boldsymbol{j}$. Find **(Cirrito 12.5.1, p429)**

   a. $|\mathbf{u} + \mathbf{v}|$
   b. $|\mathbf{u}| + |\mathbf{v}|$
   c. $|-3\mathbf{u}| + |3\mathbf{v}|$
   d. $\frac{1}{|u|}\mathbf{u}$

2. (**A1.2 - N**) (**CI**) Mr. S. would like to solve the equation $\log_4(x + 1) + \log_{16}(x - 3) = 2$.

   a. Explain why he cannot start by using the addition rule of logarithms.
   b. Re-express $\log_{16}(x + 2)$ in terms of log base 4 (i.e. $\log_4(??)$)
   c. Hence or otherwise, solve the equation $\log_4(x + 1) + \log_{16}(x - 3) = 2$.

3. (**F2.6 - R, E**) (**CI**) Given the function $g(x) = \log_2(x + 1)$, determine the following: **(Cirrito 5.4.2, p164)**

   a. The domain and range of g.
   b. The intercept(s) of g.
   c. The equation of g^{-1}.
   d. The simplified equation of $fog(x)$ if $f(x) = 2^x - 1$.
   e. Given your answer to (d), what conclusion can you make about $f(x)$?

4. (**SP5.8 - N**) (**CA**) Harry Potter books are purchased by readers of all ages. Forty percent of these books are purchased by readers of ages over 30 years! A random sample of 15 readers is selected. Find the probability that: **(Cirrito 16.3.4, p544)**

   a. 10 of the readers are over 30 years of age.
   b. At least 2 of the readers are over 30 years of age.
   c. At most 2 readers are over 30 years of age.

Math SL PROBLEM SET 27

5. (**SP5.4 - E**) (**CA**) A large electronics company produces LCD monitors to be used in the computer industry. The monthly total cost of production over the period of one year is given in the table below. (The number of units produced is in thousands and the cost is in thousands of euros) **(Oxford 10.1, p334)**

Number of units produced	Cost of production
16	1875
31	2586
57	3716
76	4712
13	1690
25	2191
49	3319
71	4362
20	2005
38	2775
63	4116
81	4860

a. Create a scatter-plot of the data.
b. Write down the equation of the regression line, which represents the association between the units of production and the costs). Draw the line on the scatterplot.
c. Interpret the slope of the line and comment on the strength of this association.
d. What would be the predicted production costs for producing 42,000 units?
e. If the selling price of each unit during this year is 105 euros, what is the production level where the sales are equal to the costs?

Math SL PROBLEM SET 27

6. (**T3.2 - R**) (**CI**) Given that $\tan(\theta) = \frac{5}{8}$, determine: **(Cirrito 10.1.2, p316)**

   a. The values of $\sin(\theta)$ and $\cos(\theta)$.
   b. Hence or otherwise, find the value of $\sin(2\theta)$ and $\cos(2\theta)$
   c. If θ is an angle measuring approximately 0.55 radians, find the measures of three other three angles in the domain of $-2\pi \leq \theta \leq 2\pi$ whose tangent ratio is $\frac{5}{8}$.

Section B (Extended Response/Investigation)

7. (**V4.3 - N**) (**CI**) Points (x, y) described by the equations $x = 1 + 2t$ and $y = 3 + t$ form a line. Is the point (7, 6) on this line? How about (−3, 1)? How about (6, 5.5)? How about (11, 7)? **(Cirrito 12.7.1 p444)**

8. (**V4.3 - N**) (**CA**) Now use your calculator to graph the function $(x, y) = (1,3) + t(2,1)$ using parametric mode. You will enter the equation as $x(t) = 1 + 2t$ and $y(t) = 3 + t$. What is the role or significance of the parameter t ? **(Cirrito 12.7.1 p444)**