BECA / Huson / 12.1 IB Math SL Name:
2 March 2018

Homework: Review-problems (answer on lined paper)

1a. Let $f(x) = 8x + 3$ and $g(x) = 4x$, for $x \in \mathbb{R}$.

Write down $g(2)$. *[1 mark]*

1b. Find $(f \circ g)(x)$. *[2 marks]*

1c. Find $f^{-1}(x)$. *[2 marks]*

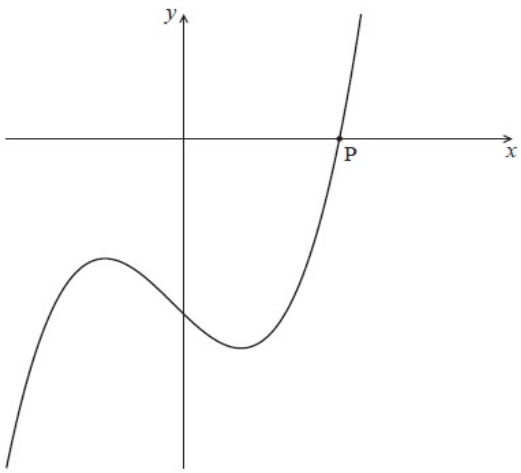
2a. In an arithmetic sequence $u_{10} = 8,\ u_{11} = 6.5$.

Write down the value of the common difference. *[1 mark]*

2b. Find the first term. *[3 marks]*

2c. Find the sum of the first 50 terms of the sequence. *[2 marks]*

3a. Let $f(x) = x^3 - 2x - 4$. The following diagram shows part of the curve of *f*.



The curve crosses the *x*-axis at the point P.

Write down the *x*-coordinate of P. *[1 mark]*

3b. Write down the gradient of the curve at P. *[2 marks]*

3c. Find the equation of the normal to the curve at P, giving your equation in the form $y = ax + b$.

[3 marks]

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4a. The following figures consist of rows and columns of squares. The figures form a continuing pattern.

Figure 1 has two rows and one column. Figure 2 has three rows and two columns.

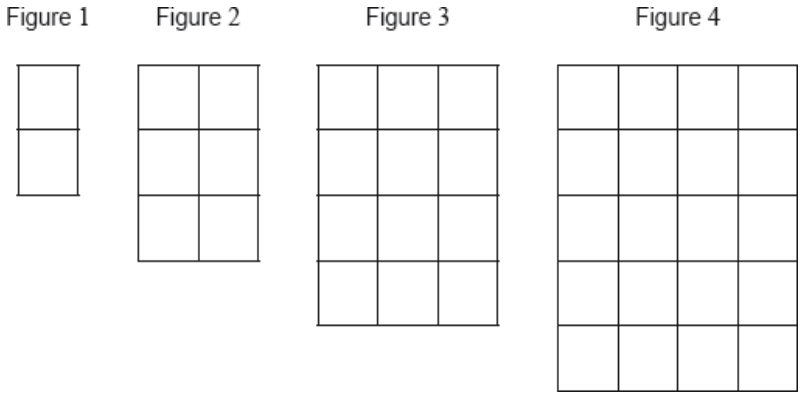

Figure 5 has p rows and q columns.

Write down the value of p; *[1 mark]*

4b. Write down the value of q. *[1 mark]*

4c. Each small square has an area of $1\ \text{cm}^2$. Let A_n be the total area of Figure n. The following table gives the first five values of A_n.

n	1	2	3	4	5
A_n (cm^2)	2	6	12	20	k

Find the value of k. *[2 marks]*

4d. Find an expression for A_n in terms of n. *[2 marks]*

5a. Consider the following frequency table.

x	Frequency
2	8
4	15
7	21
10	28
11	3

Write down the mode. *[1 mark]*

5b. Find the value of the range. *[2 marks]*

5c. Find the mean. *[2 marks]*

5d. Find the variance. *[2 marks]*

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6a. Let $f(x) = x^2 + x - 6$.

Write down the y-intercept of the graph of f. *[1 mark]*

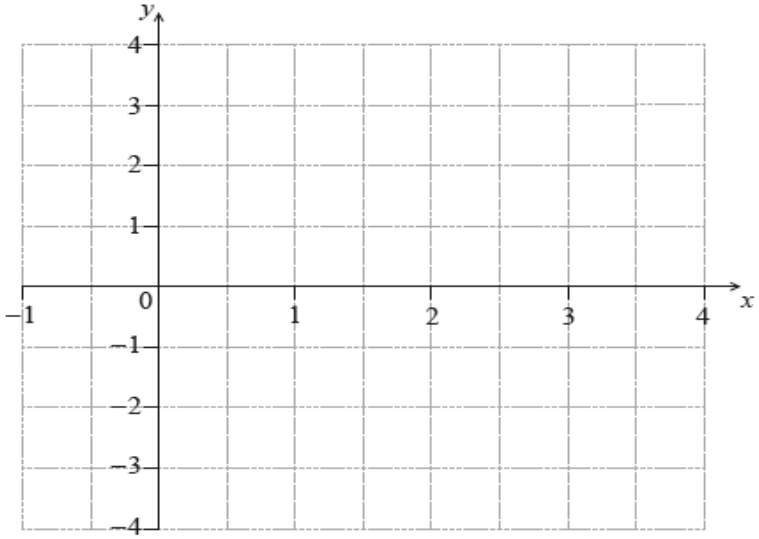
6b. Solve $f(x) = 0$. *[3 marks]*

7a. Let $f(x) = 3\sin(\pi x)$.

Write down the amplitude of f. *[1 mark]*

7b. Find the period of f. *[2 marks]*

7c. On the following grid, sketch the graph of $y = f(x)$, for $0 \leq x \leq 3$. *[4 marks]*

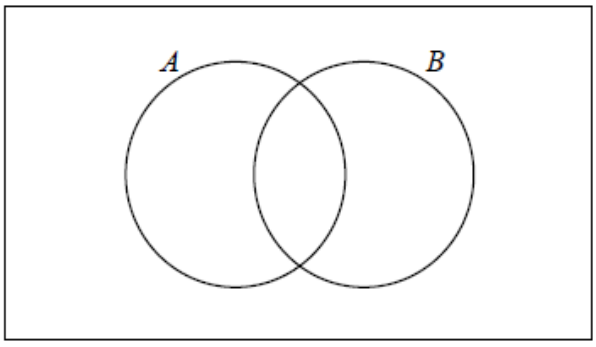


8a. Let A and B be independent events, where $\mathrm{P}(A) = 0.3$ and $\mathrm{P}(B) = 0.6$.

Find $\mathrm{P}(A \cap B)$. *[2 marks]*

8b. Find $\mathrm{P}(A \cup B)$. *[2 marks]*

8c. On the following Venn diagram, shade the region that represents $A \cap B'$.



[1 mark]

8d. Find $\mathrm{P}(A \cap B')$. *[2 marks]*

 Name:

9a. Let $f(x) = e^{6x}$.

Write down $f'(x)$. *[1 mark]*

9b. The tangent to the graph of *f* at the point $P(0, b)$ has gradient *m*.

(i) Show that $m = 6$.

(ii) Find *b*. *[4 marks]*

9c. Hence, write down the equation of this tangent. *[1 mark]*

10a. The following diagram shows ΔPQR, where RQ = 9 cm, $P\hat{R}Q = 70^\circ$ and $P\hat{Q}R = 45^\circ$.

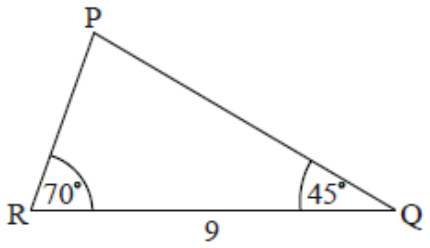


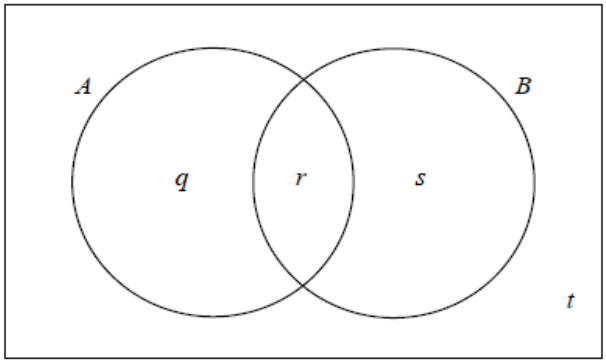
diagram not to scale

Find $R\hat{P}Q$. *[1 mark]*

10b. Find PR. *[3 marks]*

10c. Find the area of ΔPQR. *[2 marks]*

11a. Events *A* and *B* are such that $\mathrm{P}(A) = 0.3$, $\mathrm{P}(B) = 0.6$ and $\mathrm{P}(A \cup B) = 0.7$.



The values *q*, *r*, *s* and *t* represent probabilities.

Write down the value of *t*. *[1 mark]*

11b. (i) Show that $r = 0.2$.

(ii) Write down the value of *q* and of *s*. *[3 marks]*

11c. (i) Write down $\mathrm{P}(B')$.

(ii) Find $\mathrm{P}(A|B')$. *[3 marks]*

12a. Let $\overrightarrow{\mathrm{OA}} = \begin{pmatrix} -1 \\ 0 \\ 4 \end{pmatrix}$ and $\overrightarrow{\mathrm{OB}} = \begin{pmatrix} 4 \\ 1 \\ 3 \end{pmatrix}$.

(i) Find $\overrightarrow{\mathrm{AB}}$.

(ii) Find $\left|\overrightarrow{\mathrm{AB}}\right|$. *[4 marks]*

12b. The point C is such that $\overrightarrow{\mathrm{AC}} = \begin{pmatrix} -1 \\ 1 \\ -1 \end{pmatrix}$.

Show that the coordinates of C are $(-2,\ 1,\ 3)$. *[1 mark]*

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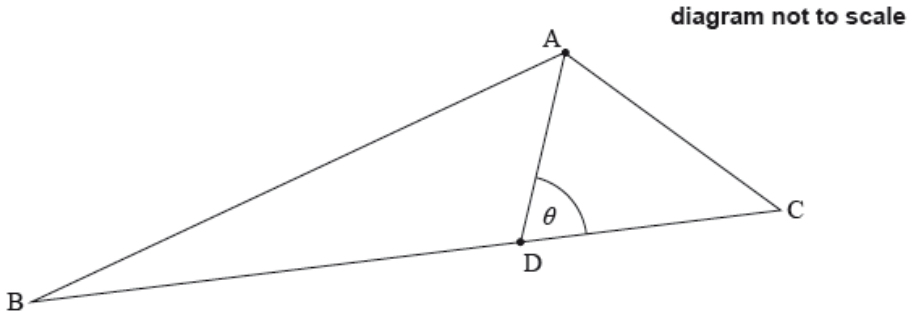
12c. The following diagram shows triangle ABC. Let D be a point on [BC], with acute angle $\mathrm{ADC} = \theta$.



Write down an expression in terms of θ for

(i) angle ADB;

(ii) area of triangle ABD. *[2 marks]*

12d. Given that $\frac{\text{area } \Delta\text{ABD}}{\text{area } \Delta\text{ACD}} = 3$, show that $\frac{\text{BD}}{\text{BC}} = \frac{3}{4}$. *[5 marks]*

12e. Hence or otherwise, find the coordinates of point D. *[4 marks]*

13a. The probability distribution of a discrete random variable *X* is given by

$$\mathrm{P}(X = x) = \frac{x^2}{14},\ x \in \{1, 2, k\},\ \text{where} k > 0$$

Write down $\mathrm{P}(X = 2)$. *[1 mark]*

13b. Show that $k = 3$. *[4 marks]*

13c. Find $\mathrm{E}(X)$. *[2 marks]*