

SUMMER REVIEW PACKET

For students entering IB Math Studies 2

Name:

The attached assignment covers prerequisites for math studies. In other words, these are objectives that you should have mastered IB Math Studies 1. We will be testing on these objectives the first or second class of the year. The assignment is an opportunity for you to review and ensure that you have mastered the prerequisites.

Linear and Simultaneous Equations

- Find the equation of the line in general form, through:
 - $(1, -5)$ with gradient $\frac{2}{3}$
 - $(2, -3)$ and $(-4, -5)$
- If $5x - 7y = 8$ and $3x + ky = -11$ are the equations of two lines, find the value of k for which:
 - the lines are parallel
 - the lines are perpendicular
- A point T on the y -axis, is 3 units from the point A(-1, 2). Find:
 - the coordinates of T (there are two points T_1, T_2 say)
 - the equation of the line AT_1 , given that T_1 is above T_2 .
- If P(x, y) is equidistant from A(-1, 4) and B(3, -2):
 - draw a sketch of the possible positions of P
 - find the equation connecting x and y .
- Determine the nature of the triangle KLM for K(-5, -2), L(0, 1) and M(3, -4).
- Use midpoints to find the fourth vertex, K, of parallelogram HIJK for H(3, 4), I(-3, -1), and J(4, 10).
- Find the equation of the perpendicular bisector of the line segment joining P(7, -1) to Q(-3, 5).

Number Sets, Measurements, and Laws of Algebra

- 1 $P = \{2, 3, 5, 7\}$ and $Q = \{5, 7, 9\}$
a Find i $P \cap Q$ ii $P \cup Q$ b Are P and Q disjoint sets? c Is $Q \subseteq P$?
- 2 Find $1834 - 712 + 78$.
- 3 By how much does 738 exceed 572?
- 4 How many times larger than 7×8 is 700×80 ?
- 5 Write down the 37th even number.
- 6 If 73 students have a total mass of 4161 kg, what is their average mass?
- 7 My bank account contains \$3621 and I make monthly withdrawals of \$78 for 12 months. What is my new bank balance?
- 8 List the first 6 powers of 2, starting with 2.
- 9 Write $2^2 \times 3 \times 5$ as a natural number.
- 10 Write 420 as the product of its prime factors in exponent form.
- 11 What is the largest prime number which will divide into 91?
- 12 List the factors of 162.
- 13 Find the largest number which divides exactly into both 63 and 84.
- 14 List the multiples of 6 which lie between 30 and 50.
- 15 Determine the LCM of 6 and 8.
- 16 Find the smallest multiple of 11 which is greater than 300.
- 17 Simplify $24 - 12 \div 2^2$

Sequences and Series

1 List the first four members of the following sequences defined by:

a $u_n = 3^{n-2}$

b $u_n = \frac{3n+2}{n+3}$

c $u_n = 2^n - (-3)^n$

2 A sequence is defined by $u_n = 68 - 5n$.

a Prove that the sequence is arithmetic.

b Find u_1 and d .

c Find the 37th term.

d What is the first term of the sequence less than -200 ?

3 a Show that the sequence $3, 12, 48, 192, \dots$ is geometric.

b Find u_n and hence find u_9 .

4 Find k if $3k$, $k - 2$ and $k + 7$ are consecutive terms of an arithmetic sequence.

5 Find the general term of an arithmetic sequence given that $u_7 = 31$ and $u_{15} = -17$. Hence, find the value of u_{34} .

6 A sequence is defined by $u_n = 6\left(\frac{1}{2}\right)^{n-1}$.

a Prove that the sequence is geometric.

b Find u_1 and r .

c Find the 16th term to 3 significant figures.

7 Show that $28, 23, 18, 13, \dots$ is arithmetic and hence find u_n and the sum S_n of the first n terms in simplest form.

8 Find k given that 4 , k and $k^2 - 1$ are consecutive geometric terms.

Descriptive Statistics

- 2 The following marks were scored for a test where the maximum score was 50:
47 32 32 29 36 39 40 46 43 39 44 18 38 45 35 46 7 44 27 48
- Construct an ordered stemplot for the data.
 - What percentage of the students scored 40 or more marks?
 - What percentage of the students scored less than 30 marks?
 - If a score of 25 or more is a pass, what percentage of the students passed?
 - Describe the distribution of the data.
- 3 A frequency table for the heights of a basketball squad is given below.

| <i>Height (cm)</i> | <i>Frequency</i> |
|--------------------|------------------|
| 170 - | 1 |
| 175 - | 8 |
| 180 - | 9 |
| 185 - | 11 |
| 190 - | 9 |
| 195 - | 3 |
| 200 - < 205 | 3 |

- Explain why 'height' is a continuous variable.
- Construct a histogram for the data. The axes should be carefully marked and labelled and include a heading for the graph.
- What is the modal class? Explain what this means.
- Describe the distribution of the data.

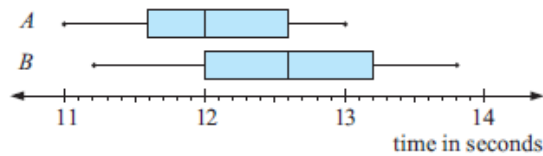
4 Six scores have mean 8. What must the seventh score be to increase the mean by 1?

5 The data below shows the distance, in metres, Kapil was able to throw a cricket ball.

| | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|
| 71.2 | 65.1 | 68.0 | 71.1 | 74.6 | 68.8 | 83.2 | 85.0 | 74.5 | 87.4 |
| 84.3 | 77.0 | 82.8 | 84.4 | 80.6 | 75.9 | 89.7 | 83.2 | 97.5 | 82.9 |
| 90.5 | 85.5 | 90.7 | 92.9 | 95.6 | 85.5 | 64.6 | 73.9 | 80.0 | 86.5 |

- Determine the highest and lowest value for the data set.
- Produce between 6 and 12 groups in which to place all the data values.
- Prepare a frequency distribution table.
- For this data, draw:
 - a frequency histogram
 - a relative frequency histogram
 - a cumulative frequency graph.
- Determine:
 - the mean
 - the median.

6 The given parallel boxplots represent the 100-metre sprint times for the members of two athletics squads.

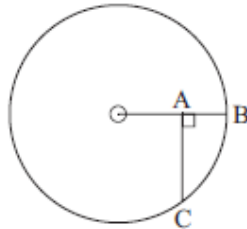


- Determine the 5-number summaries for both *A* and *B*.
 - Determine the
 - range
 - interquartile range for each group.
 - Copy and complete:
 - The members of squad generally ran faster times.
 - The times in squad were more varied.
- 7 Find, using your calculator, the mean and standard deviation of these sets of data:
- 117, 129, 105, 124, 123, 128, 131, 124, 123, 125, 108
 - 6.1, 5.6, 7.2, 8.3, 6.6, 8.4, 7.7, 6.2
- 8 Find *a*, given that 3, 0, *a*, *a*, 4, *a*, 6, *a* and 3 have a mean of 4.

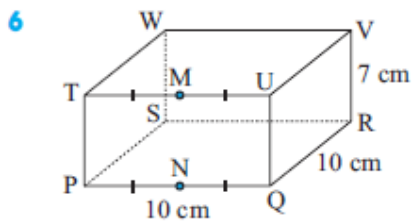
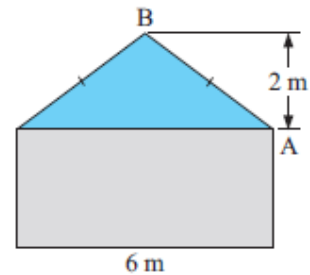
Geometry

- 1 A yacht sails 8.6 km due east and then 13.2 km south. Find the distance and bearing of the yacht from its starting point.
- 2 Determine the height of a tree which casts a shadow of 13.7 m when the sun is at an angle of 28° .
- 3 A flagpole 19.6 m high is supported by 3 wires which meet the ground at an angle of 56° . Determine the total length of the three wires.

- 4 In the given figure $AB = 1$ cm and $AC = 3$ cm. Find:
 - a the radius of the circle
 - b the angle subtended by chord BC at the centre of the circle.



- 5 In the illustrated roof structure:
 - a how long is the timber beam AB
 - b at what angle is the beam inclined to the horizontal?



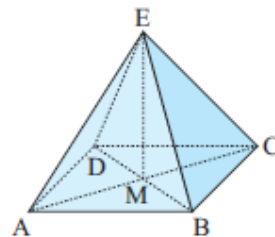
M and N are the midpoints of TU and PQ respectively.

- a Draw a sketch of triangle RMN showing which angle is the right angle.
- b Find the length of RN.
- c Find the measure of angle RMN.

- 7 ABCD is a square-based pyramid. E, the apex of the pyramid is vertically above M, the point of intersection of AC and BD.

If an Egyptian Pharaoh wished to build a square-based pyramid with all edges 200 m, find:

- a how high (to the nearest metre) the pyramid would reach above the desert sands
- b the measure of the angle between a slant edge and a base diagonal.



- 8 Determine the area of a triangle with sides 11 cm, 9 cm and included angle 65° .