YEAR 1 | MATHEMATICS | WEEK 19 EXAM QUESTIONS

Question	1	2	3	5	6	9	12	14	15	16	Total
Marks											
Max Marks	1	1	5	4	5	13	5	4	4	8	50

Completed in Exam Conditions: ✓/X

COMPLETE THE FOLLOWING QUESTIONS UNDER EXAM CONDITIONS
TIME ALLOWED: 60 MINUTES
CHECK AND CORRECT USING THE MARK SCHEME

Marked by (if peer marked):

1 Simplify $\dfrac{\left(a^4b\right)^{\frac{5}{2}}}{(a^3b^{\frac{1}{2}})^{-3}}$

Circle your answer.

[1 mark]

$a^{19}b$ $\quad$ ab^4 $\quad$ ab $\quad$ $a^{19}b^4$

2 Find the solution of the inequality

$$(3-x)(x+4)<0$$

Circle your answer.

[1 mark]

$-4<x<3$ $\quad$ $x<-4$, $x>3$ $\quad$ $-3<x<4$ $\quad$ $x<-3$, $x>4$

3 (a) Find the first three terms, in ascending powers of x, of the expansion of $\left(3-\frac{x}{2}\right)^8$

[3 marks]

3 (b) Use your expansion to estimate the value of 2.995^8.

[2 marks]

5 The points A and B have coordinates (1, –2) and (5, 6) respectively.

Given that the point with coordinates $(p, p + 8)$ lies on the perpendicular bisector of AB, find the value of p.

[4 marks]

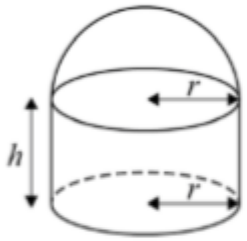
6 Differentiate $f(x) = 3x^4$ from first principles.

Fully justify your answer.

[5 marks]

9 A company plans to manufacture a flour shaker with a capacity of 200 cubic centimetres.

The company models the flour shaker as a cylinder with base radius r centimetres and height h centimetres, attached to a hemisphere at one end, as shown in the diagram below.



It can be assumed that the flour shaker will be made from a material of negligible thickness.

For a **sphere** radius r, surface area $= 4\pi r^2$ and volume $= \frac{4}{3}\pi r^3$

9 (a) Show that the total surface area A of the flour shaker is $A = \frac{5\pi r^2}{3} + \frac{400}{r}$

[4 marks]

9 (b) In order to minimise the cost of production, the company wishes to minimise the surface area.

Find the dimensions of the flour shaker when it has the minimum surface area.

Fully justify your answer.

[7 marks]

9 (c) State one limitation of the model and suggest an improvement.

[2 marks]

12 (a) The events A and B are such that $P(A) = 0.4$ and $P(B) = 0.5$

A and B are mutually exclusive.

Find $P(A \cup B)$.

[1 mark]

12 (b) The events C and D are such that $P(C) = 0.8$ and $P(D) = 0.3$.

C and D are independent.

12 (b) (i) Find $P(C \cup D)$

[3 marks]

12 (b) (ii) Find $P(C' \cap D')$

[1 mark]

14 The discrete random variable Y has probability distribution given by:

Y	0	1	2	3	4
$P(Y = y)$	a	b	c	0.1	0.15

where a, b and c are constants.

$P(Y = 1) = P(Y \geq 3)$

$P(Y = 0) = P(Y = 2) - 0.1$

Find the values of a, b and c.

[4 marks]

15 It is given that $X \sim B(5, p)$ and $P(X = 3) = P(X = 4)$

15 (a) Find the value of p, given that $0 < p < 1$

[3 marks]

15 (b) Explain how you have used $0 < p < 1$ in your answer to part **(a)**.

[1 mark]

16 A garden centre claims that 90% of a particular type of seed will produce yellow flowers.

Xavier randomly selects 40 of these seeds and 32 produce yellow flowers.

Xavier wants to use a binomial distribution to model the number of yellow flowers produced.

16 (a) State, in context, two assumptions necessary for the binomial distribution to be applicable in this case.

[2 marks]

16 (b) Xavier claims that the garden centre is overstating the proportion of these seeds that will produce yellow flowers.

Carry out a hypothesis test at the 5% significance level to investigate Xavier's claim.

[6 marks]