



MALVERN
COLLEGE

Transform Their World

Surname:

First name:

Prep School:

Malvern College Academic
Scholarship Specimen Examinations

13+ MATHS PAPER 1

- » This examination is 60 minutes long.
- » This examination has 100 marks in total.
- » No Calculators are allowed for this paper
- » Working must be shown to gain credit: No marks will be awarded for guessing or approaches that involve trial and improvement.

1. Calculate the following

a. $2\frac{1}{4} + \frac{3}{7}$

_____ [3]

b. $3\frac{1}{8} \div 3\frac{3}{4}$

_____ [3]

c. $\frac{5}{8}$ of 120

_____ [2]

d. $\frac{1}{6}$ as a percentage of $\frac{2}{3}$

_____ [2]

2. In the following algebraic expressions

a. Simplify $a + 2a - b + (a - b)(2 - b)$

_____ [2]

a. Expand $(x + 3)(2y + x - 1)$

_____ [3]

a. Factorise $8d^3e^5 + 28d^4e$

_____ [2]

3. Solve the following equations for x , leaving answers as fractions where necessary

a. $4x - 12 = 17$

_____ [2]

b. $2(x - 3) - 6 = 5(1 - x)$

_____ [3]

c. $\frac{(x-1)}{3} + 5 = \frac{(2x-3)}{2}$

_____ [3]

d. $\frac{4}{(2x-3)} + 5 = \frac{(5x-2)}{x}$

_____ [3]

4. $A=2^3 \times 3^2 \times 7^6$ and $B=2^4 \times 3^4 \times 5^2$

Find (give your answers as the product of prime factors if easiest)

a. The Highest Common Factor of A and B

_____ [2]

b. The Lowest Common multiple of A and B

_____ [2]

c. The smallest number needed to multiply A with to make a square number.

_____ [1]

d. The smallest value k, such that kAB is a cube number.

_____ [2]

5. Find the value of n in each case

a. $5^3 \times 5^3 = 5^n$

_____ [1]

b. $5^n \div 5^2 = 5^8$

_____ [1]

c. $5^3 + 5^3 + 5^3 + 5^3 + 5^3 = 5^n$

_____ [2]

d. $(5^3)^6 = 25^n$

_____ [2]

- 6.** One third of the balls in a bag are green, the rest are yellow.
There are 10 more yellow balls than green balls. How many balls are in the bag?

_____ [2]

- 7.** The MEAN of 5 whole numbers is 5, the MEDIAN is 4 and the MODE is 3.
Write down all possible sets of the 5 numbers.

_____ [4]

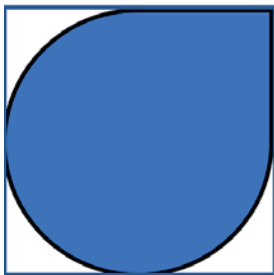
- 8.** A train travels from Northton to Southton. It covers the first 120 km at 90 km/h and the final 20 km at 120 km/h. What is its average speed for the whole journey of 140 km?

_____ [4]

9. Ted sits the Junior Maths Challenge in his country Mathsaria. The paper consists of 25 questions. If a question is correct Ted scores 4 marks. If a question is wrong, Ted loses 1 mark. Ted is initially given 25 marks. Ted answers all the questions and scores 85 marks. How many questions does he get correct?

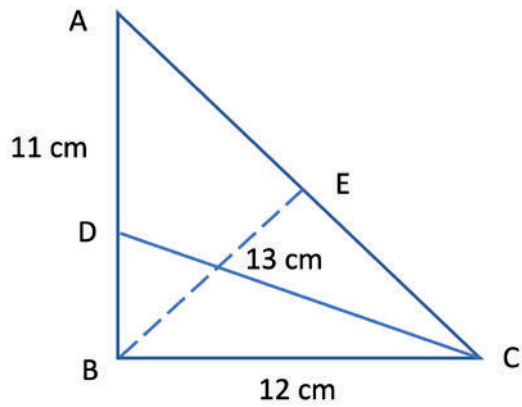
_____ [3]

10. The shaded shape below is cut from a square piece of card, with side length 20 cm. How much card is discarded? (Give your answer in terms of π).
The area of a circle is given by $A = \pi r^2$



_____ [3]

11. In the shape below, $AD = 11$ cm, $BC = 12$ cm and $CD = 13$ cm. ABC is a right angle.



- a. Find BD

_____ [2]

- b. Find AC

_____ [2]

- c. Calculate the area of ABC

_____ [2]

E is the point on AC such that BE is the point on AC closest to B .

- d. Find the length of BE .

_____ [2]

12. Use the following information to answer the questions below:

$$a^2 - b^2 = (a + b)(a - b) \quad 28^2 = 784$$

a. Factorise $4x^2 - 9$

_____ [2]

b. Factorise $25a^2 - \frac{b^2}{16}$

_____ [2]

c. Find the value of $28^2 - 22^2$

_____ [2]

d. Find the value of 0.28^2

_____ [2]

e. Find the value of $\frac{28^3}{2.8}$

_____ [2]

f. Find $\frac{78.4}{0.0028}$

_____ [2]

13. Amelia and Belinda collect football stickers.

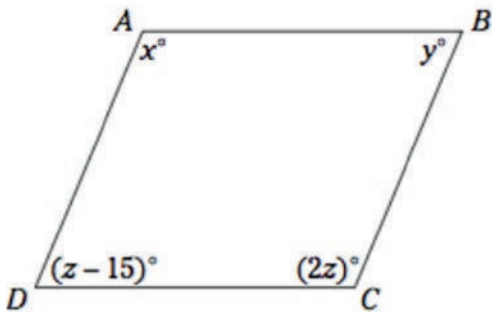
- a. Amelia has 60 stickers and in a deal gains 15% more. She then loses a third of the stickers. How many does she have left?

_____ [2]

- b. Belinda gives away 20% of her stickers but then increases her stock by 10% to end up with 44 stickers. How many did she start with?

_____ [3]

14. The diagram shows a parallelogram, ABCD.



Find the values of x , y and z

$x =$ _____ [1]

$y =$ _____ [1]

$z =$ _____ [2]

15. Two sequences are given such that $s_n = 3, 8, 13, 18, \dots$ and $t_n = 3, 6, 11, 18, \dots$ where for example $s_3 = 13$

Find

a. s_{10}

_____ [2]

b. n where $s_n = 118$

_____ [2]

c. formulae for s_n and t_n

$s_n =$ _____ [1]

$t_n =$ _____ [2]

d. t_{20}

_____ [1]

A third sequence linked to s_n and t_n by the formula

$$u_n = a s_n + b t_{(n+c)} \quad \text{is} \quad u_n = 3, 3, 5, 9, 15 \dots$$

e. Find u_{10}

_____ [2]

f. By finding values for a, b and c , find u_n in terms of s_n and t_n

_____ [2]

g. Find an n^{th} term formula for u_n

_____ [3]

END OF QUESTION PAPER