Mock Grade 7

Maths Booklet 1

Paper 1H
Non-Calculator

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1 White shapes and black shapes are used in a game.
Some of the shapes are circles.
All the other shapes are squares.

The ratio of the number of white shapes to the number of black shapes is 5 : 2

The ratio of the number of white circles to the number of white squares is 3 : 8

The ratio of the number of black circles to the number of black squares is 7 : 5

Work out what fraction of all the shapes are circles.

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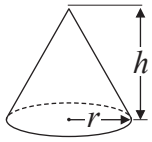
(Total for Question 1 is 4 marks)

2 A cone has a volume of 130 cm^3.
The radius of the cone is 8.11 cm.

(a) Work out an estimate for the height of the cone.

Volume of cone = $\frac{1}{3}\pi r^2 h$



.....cm

(3)

John uses a calculator to work out the height of the cone to 2 decimal places.

(b) Will your estimate be more than John's answer or less than John's answer?
Give reasons for your answer.

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(1)

(Total for Question 2 is 4 marks)

3 n is an integer greater than 1

Prove that $(3n + 1)^2 - (3n - 1)^2$ is always a multiple of 12

(Total for Question 3 is 4 marks)

4 Prove algebraically that the sum of $(n + 2)(n + 1)$ and $n + 2$ is always a square number.

(Total for Question 4 is 4 marks)

5 Express $\sqrt{32} + \sqrt{8}$ as a surd in its simplest form.

$a =$ .....

(Total for Question 5 is 3 marks)

6 y is inversely proportional to the square root of d
When $d = 100$, $y = 4$

d is directly proportional to x^2
When $x = 3$, $d = 72$

Find a formula for y in terms of x.
Give your answer in its simplest form.

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(Total for Question 6 is 5 marks)

7 (a) Factorise $4a^2 - 9b^2$

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(1)

(b) Hence, or otherwise, simplify fully $4(x^2 + 1)^2 - 9(x^2 - 1)^2$

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(3)

(Total for Question 7 is 4 marks)

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8 There are only red counters, blue counters and purple counters in a bag.
The ratio of the number of red counters to the number of blue counters is 7 : 23

Sam takes at random a counter from the bag.
The probability that the counter is purple is 0.4

Work out the probability that Sam takes a red counter.

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(Total for Question 8 is 3 marks)

9 Simplify fully $\dfrac{3x^2 + 11x - 4}{x^2 + 3x - 4}$

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(Total for Question 9 is 3 marks)

10 Prove algebraically that the sum of the squares of any 2 even positive integers is always a multiple of 4.

(Total for Question 10 is 2 marks)

11 Find the exact value of $\cos 30° \times \tan 60°$
Give your answer in its simplest form.

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(Total for Question 11 is 2 marks)