St. Patrick's High School, Keady

Mathematics Department

GCSE Mathematics Practice Booklet

M4

Topic 1 – Number 1

Multiples and Factors HCF LCM

Indices, Powers, Roots

Accuracy and Bounds

Growth and Decay

Questions taken from CCEA Past Papers

Mark Scheme included at the end of this booklet

Q1 A number, expressed as a product of its prime factors, is $2^2 \times 3 \times 5^2$

(a) What is the number?

Answer _____ [1]

(b) **(i)** This number is multiplied by 9

Write the new number as a product of its prime factors.

Answer _____ [1]

(ii) Is this new number a square number?

You must explain your answer.

Answer _____ because _____

_____ [1]

Q2 Write 200 as a product of prime factors, using index notation.

Answer _____ [3]

Q3 **(a)** **(i)** Write 30 as a product of prime factors.

Answer 30 = _____ [1]

(ii) Write 22 as a product of prime factors.

Answer 22 = _____ [1]

(b) An airport bus leaves the city hall every 30 minutes.
A shuttle bus leaves the city hall every 22 minutes.
An airport bus and a shuttle bus both leave the city hall at 8.00 am.
At what time will an airport bus and a shuttle bus next leave the city hall at the same time?

Answer _____ [3]

Q4 Find the lowest common multiple (LCM) of 54 and 90

Answer _____ [2]

Q5 Write 600 as a product of prime factors.

Express your answer in index notation.

Answer _____ [3]

Q6 **(a)** Write 200 as a product of its prime factors.

Give your answer in index notation.

Answer _____ [3]

(b) Hence find the smallest number you can multiply 200 by to make a cube number.

Answer _____ [1]

Q7 The volume of oil in a tank **decreases** by 5% every hour.
At 11am there are 9000 litres of oil in the tank.
What will the volume of oil be at 2pm?

Answer _____ litres [3]

Q8 In a group of golfers there are 37 males and 23 females.
19 of the males are wearing glasses and 14 of the females are wearing glasses.
What percentage of the group are wearing glasses?

Answer _____ % [3]

Q9 **(a)** What percentage is £35.25 of £47?

Answer _____ % [2]

(b) John bought a new phone for £44 plus 17.5% VAT.

Mark bought a similar phone in a different shop.

Mark paid £50.31 including VAT at 17.5%

Whose phone was more expensive and by how much?

Show all your working.

Answer _____ by £ _____ [3]

Q10 Eleven pencils each measuring 13 cm, to the nearest cm, in length are placed end to end.

Find the shortest possible total length and longest possible total length of the pencils.

Shortest length _____ cm [1]

Longest length _____ cm [1]

Q11 16 buckets each hold 8 litres, to the nearest litre.
Find the largest and smallest total volume of the 16 buckets.
Explain your reasoning clearly.

[3]

Q12 Larry and Jake each measure the length of a different slug. They both say that their slug is 6 cm to the nearest centimetre. Does this mean that both slugs are exactly the same length?

Explain your answer clearly.

_____

_____ [2]

Q13 Yasmin draws a rectangle measuring 2 cm by 4 cm (both to the nearest cm).

She says the area must be 8 cm^2 to the nearest cm^2

Explain why she is wrong.

[2]

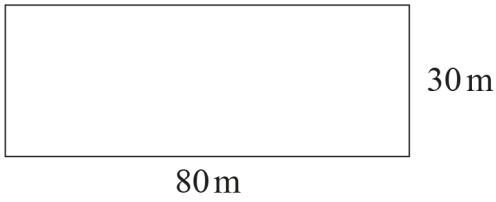
Q14

The length of the side of a square is 8.3cm, correct to 1 decimal place.

Work out the lower bound for the area of the square.

Answer _____ cm^2 [2]

Q15 A rectangle has been recorded as having a length of 80 m, correct to the nearest 10 m, and a width of 30 m, correct to the nearest m.



Jane says the area could be 2400 m^2

Steve says the area could be 1875 m^2

Paula says the area could be 2212.5 m^2

Which of the three is definitely not correct and what mistake has been made?

Explain your reasoning clearly.

[2]

Q16 Marie gets a basic monthly salary of £560 plus a commission of 22% of her sales that month.
In April her total salary was £3299
Work out her sales in April.

Answer £ _____ [3]

Q17 A bed has a sale price of £257.40
This is a saving of 22% on the original price.

What was the original price of the bed?

Answer £ _____ [3]

Q18 Gillian sold her formal dress online for £130.50
This was one-eighth more than the cost price of the dress.
What was the cost price?

Answer £ _____ [3]

Q19 Over a year a car decreased in value from £12 500 to £10 500

Calculate the percentage decrease.

Answer _____ % [3]

Q20 A special offer shampoo bottle contains 20% extra.

It contains 900 ml of shampoo.

How much shampoo was in the original bottle?

Answer _____ ml [3]

Q21 The temperature in a desert fell to 10ºC during a twelve hour period.

This represented an 80% decrease.

Calculate the temperature at the beginning of the twelve hour period.

Answer _____ºC [3]

Q22 The population of a town in 2014 was 80 058

This was a 65% increase on its population in 1994

What was the population in 1994?

Answer _____ [3]

Q23 Peter, Jack and Colin share a flat. They pay the rent monthly.

Peter pays 30% of the monthly rent.

Jack pays $\frac{3}{8}$ of the monthly rent.

Colin pays £520 of the monthly rent.

Calculate the total monthly rent for the flat.

Answer £ _____ [5]

Q24 A restaurant bill, including 15% service charge, was £98.90
How much was the service charge?

Answer £ _____ [3]

Q25 After a 7.5% pay rise Mr Jones' salary was £29 455

What was his salary before the pay rise?

Answer £ _____ [3]

Q26 A full jar of coffee weighs 670 g. An empty coffee jar weighs 450 g.

Both are measured to the nearest 5 g.

Calculate the maximum weight of coffee in the jar.

Answer _____ g [3]

Q27

A train travels 736 km (correct to the nearest km).

The journey takes 4.5 hours (correct to the nearest 0.1 hour).

Work out the minimum possible average speed and the maximum possible average speed in km/h.

Answer minimum average speed is _____ km/h

maximum average speed is _____ km/h [4]

Q28

A man has mass 74 kg and his son has mass 42 kg, both measured to the nearest kilogram.

What is the maximum difference in mass between the man and his son?

Answer _____ kg [2]

Q29

Martin runs 200 metres, correct to the nearest metre.

It takes him 26.4 seconds, correct to the nearest tenth of a second.

Calculate the upper bound of Martin's average speed.

Answer _____ m/s [3]

Q30

Given $m = \frac{\sqrt{s}}{t}$ and

s = 5.14 rounded to 2 decimal places
t = 9.384 rounded to 3 decimal places

find the upper bound of m.

Answer _____ [3]

Q31

$a = 3.2$ and $b = 5.8$ are both correct to 1 decimal place.

Find

(a) the minimum possible value of $b - a$,

Answer _____ [1]

(b) the maximum possible value of $\frac{b}{a}$

Answer _____ [2]

Q32

Jack says the distance from Larne to Enniskillen is 110 miles to the nearest 10 miles.

He drove this distance at an average speed of 45 mph to the nearest 5 mph.

Calculate the least amount of time the journey could have taken.

Give your answer in hours and minutes, to the nearest minute.

Answer _____ hr _____ min [4]

Q33

An equation used in physics is $W = Fd$

where W = work done in Joules (J)

F = force in Newtons (N)

d = distance in metres (m)

The work done in moving a car is given as 12 500 J correct to 3 significant figures.

The car moves a distance of 215 m correct to the nearest metre.

Calculate the maximum and minimum force applied to the car.

Answer maximum force = _____ N

minimum force = _____ N [4]

Q34 The distance a car travels is given as 62 km correct to the nearest km.

The time taken for the journey is given as 1 hour 11 minutes correct to the nearest minute.

Find the maximum average speed of the car in km/h.

Answer _____ km/h [4]

Q35 The length of a rectangle is 5.4 cm correct to 1 decimal place.

The area of the rectangle is 23.21 cm^2 correct to 4 significant figures.

Calculate the minimum value of the width of the rectangle.

Write down all the figures on your calculator display.

Answer _____ cm [3]

1. **(a)** 300 A1

(b) **(i)** $2^2 \times 3^3 \times 5^2$ A1

(ii) No because not all the prime factors are squared A1
or alternative
No because 2700 is not a square number

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2. $200 = 2 \times 2 \times 2 \times 5 \times 5$ M1 A1

$2^3 \times 5^2$ A1

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3. **(a)** **(i)** $30 = 5 \times 3 \times 2$ A1

(ii) $22 = 11 \times 2$ A1

(b) using LCM of 30 and 22 M1
$11 \times 5 \times 3 \times 2 = 330$ minutes = 5.5 hours A1
1.30pm A1

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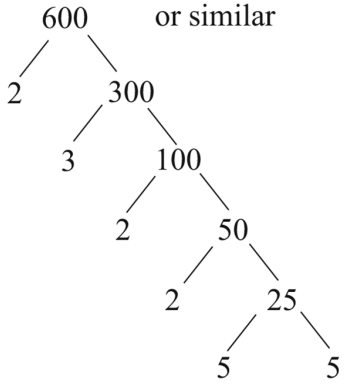
4. $54 = 2 \times 3 \times 3 \times 3$ and $90 = 2 \times 3 \times 3 \times 5$ MA1
270 A1

5.

2	600
2	300
2	150
3	75
5	25
	5

or

5	600
5	120
3	24
2	8
2	4
	2



M1 A1

$2^3 \times 3 \times 5^2$ MA1

6.

(a) Correct method used M1

$2 \times 2 \times 2 \times 5 \times 5$ A1

$2^3 \times 5^2$ A1

(b) 5 (gives 1000) A1

7.

8550 MA1

8122.5 MA1

7716.375 (accept 7716) or (7716.38) or (7716.4) MA1

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8. $\frac{33}{60}$ MA1

$\frac{33}{60} \times 100 = 55\%$ M1 A1

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9. **(a)** $\frac{35.25}{47} \times 100$ MA1

$= 75\%$ A1

(b) John's phone $\frac{17.5}{100} \times 44$ MA1

$= £7.70$

John's phone cost £51.70 MA1

John's phone is dearer by £51.70 – £50.31 = £1.39 MA1

10.

Shortest	137.5	A1
Longest	148.5	A1

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11. Clear explanation of bounds between 7.5 and 8.5 C1

Smallest volume = 16 × 7.5 = 120 litres C1

Largest volume = 16 × 8.5 = 136 litres C1

12.

Since they are measured to the nearest cm then they could measure anything from 5.5 cm to 6.5 cm and so they are not necessarily the same length.
(or similar explanation) C2

13.

Could be $1.5 \times 3.5 = 5.25$

or could be $2.5 \times 4.5 = 11.25$

or suitable values given, not rounding to 8 M1 A1

14.

8.25 as lower bound MA1

$8.25 \times 8.25 = 68.0625$ (no further rounding) MA1

15.

Max area = 85 × 30.5 = 2592.5
Min area = 75 × 29.5 = 2212.5 } MA1

Steve not correct as outside range MA1

Alternative solution

Jane 80 × 30 = 2400 is acceptable
Paula 75 × 29.5 = 2212.5 is acceptable MA1
Steve 75 × 25 = 1875 is not acceptable as lower bound for width is 29.5 not 25 MA1

16.

3299 – 560 = 2739 C1
2739 = 22% C1
12 450 C1

17.

78% = 257.40 MA1
257.40 ÷ 0.78 = 330 M1 A1

18.

9/8 = £130.50 **or** 112.5% = £130.50	MA1
130.50/9 (× 8) **or** 130.50/112.5 (× 100) **or** 14.50 **or** 1.16	MA1
= £116	A1

19.

12500 – 10500 = 2000	MA1
$\frac{2000}{12500} \times 100$	MA1
16%	A1

20.

900 ml = 120%	MA1
$\frac{900}{120} \times 100 = 750$	MA1 A1

21.

20% = 10 °C	MA1
1% = 0.5 °C	A1
100% = 50 °C	A1

22.

$165\% = 80058$	MA1
$1\% = \frac{80058}{165} = 485.2$	MA1
$100\% = 48520$	A1

23.

Peter + Jack = 67.5% (or 27/40) (or 0.675)	MA1
Colin = 32.5% (or 13/40) (or 0.325)	A1
32.5% = £520	M1
1% = £16	MA1
100% = £1600	MA1

24.

115% = £98.90	MA1
1% = £0.86 (or 100% = £86)	MA1
15% = £12.90 (£98.90 – £86)	MA1

25.

107.5% = 29455	MA1
(100%) = 29455 ÷ 107.5 × 100	MA1
= £27400	A1

Alternative Solution

(100%) = 29455 ÷ 1.075	M1 A1
= £27400	A1

26.

Maximum weight of coffee and jar = 672.5 g	MA1
Minimum weight of jar = 447.5 g	MA1
Maximum weight of coffee = 672.5 – 447.5	
= 225 g	MA1

27.

Min speed = 735.5/4.55	MA1
= 161.6483516	A1
Max speed = 736.5/4.45	MA1
= 165.505618	A1

28.

74.5 – 41.5 = 33	MA2

29.

U.B. of distance = 200.5 m
L.B. of time = 26.35 s MA1 (for both)
(if both UBs and both LBs are shown, this first mark can still be awarded)

Average speed $= \frac{200.5}{26.35}$ MA1
(for second mark, must know to use distance UB and time LB)
= 7.609108159 A1
(final mark for accurate calculation)

30.

$m = \frac{\sqrt{5.145}}{9.3835}$ MA1 MA1

$m = 0.2417284856$ A1

31.

(a) $5.75 - 3.25 = 2.5$ MA1

(b) $\frac{5.85}{3.15} = 1.\dot{8}57142\dot{}$ M1 A1

32.

$T_{min} = \frac{105}{47.5}$ MA2

$= 2.210526316$ hrs A1

$= 2$ hr 13 min A1

33.

$\text{Max} = \frac{12550}{214.5} = 58.50815851$ MA1A1

$\text{Min} = \frac{12450}{215.5} = 57.77262181$ MA1A1

34.

Max. distance = 62.5 km MA1

Min. time = 1hr 10.5 mins = 1.175 hrs MA1

Average speed $= \frac{62.5}{1.175}$ or $\frac{62.5}{70.5} \times 60$ MA1

$= 53.19148936.....$ A1

35.

$\frac{23.205}{5.45}$ MA1 MA1

4.257798165 A1
