

**N22N23 HCF & LCM**

OCR

- (b)** Katy fills some gift boxes.  
Each gift box will contain one toy and one keyring.  
Katy buys toys in bags of 8.  
Katy buys keyrings in bags of 14.

She wants to use all the toys and all the keyrings she buys.

What is the smallest number of gift boxes Katy can fill?

**(b)** .....gift boxes **[4]**

- (b) Katy fills some gift boxes.  
Each gift box will contain one toy and one keyring.  
Katy buys toys in bags of 8.  
Katy buys keyrings in bags of 14.

LCM

She wants to use all the toys and all the keyrings she buys.

What is the smallest number of gift boxes Katy can fill?

Toys  $\rightarrow$  8, 16, 24, 32, 40, 48, 56, 64,

Keyrings  $\rightarrow$  14, 28, 42, 56,

(b) .....56..... gift boxes [4]

**11**       $A = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 7$   
             $B = 2 \times 2 \times 3 \times 3 \times 5 \times 5 \times 7$

**(a)** Write A using index notation.

**(a)** .....[1]

**(b)** Show that the highest common factor (HCF) of A and B is 1260. [2]

**(c)** Show that B is larger than A, **without working them out.** [2]

11  $A = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 7$   
 $B = 2 \times 2 \times 3 \times 3 \times 5 \times 5 \times 7$

(a) Write A using index notation.

(a)  $2^4 \times 3^2 \times 5 \times 7$  [1]

(b) Show that the highest common factor (HCF) of A and B is 1260. [2]

$A = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 7$   
 $B = 2 \times 2 \times 3 \times 3 \times 5 \times 5 \times 7$

$2 \times 2 \times 3 \times 3 \times 5 \times 7$   
 $= 1260$

(c) Show that B is larger than A, without working them out. [2]

$A = 4 \times 2 \times 2 \times 3 \times 3 \times 5 \times 7 = 4$   
 $B = 2 \times 2 \times 3 \times 3 \times 5 \times 5 \times 7 = 5$

B must be bigger.

**15** A railway station has two platforms.  
Trains stop at the northbound platform every 15 minutes.  
Trains stop at the southbound platform every 18 minutes.

Two trains stopped together at 15 12.

**(a)** Work out the next time two trains stop together at this station.

**(b)** Write down two assumptions that were necessary to solve this problem.

1 .....

.....

2 .....

.....

- 15 A railway station has two platforms.  
 Trains stop at the northbound platform every 15 minutes.  
 Trains stop at the southbound platform every 18 minutes.

Two trains stopped together at 15 12.

- (a) Work out the next time two trains stop together at this station.

15 12      15 ... 15, 30, 45, 60, 75, 90  
 18 ... 18, 36, 54, 72, 90      90 min later

$$15:12 + \frac{90 \text{ min}}{1 \text{ hr } 30 \text{ min}} = 16:42$$

- (b) Write down two assumptions that were necessary to solve this problem.

1 Assumed no delays

2 No breakdowns



14 (a) A box contains only orange counters, purple counters and green counters.

A counter is taken, at random, from the box.

The probability that it is purple is  $\frac{3}{10}$  and the probability that it is green is  $\frac{7}{15}$ .

Find the ratio of orange to purple to green counters.

(a) ..... : ..... : ..... [3]

(b) A different box contains 42 red counters, 90 yellow counters and no other counters.

A group of students share these counters between them so that they each receive the same number of red counters and the same number of yellow counters.

There are no counters left over.

How many students could be in the group?

Give all possible answers and show your reasoning.

(b) ..... [3]

14 (a) A box contains only orange counters, purple counters and green counters.

A counter is taken, at random, from the box.

The probability that it is purple is  $\frac{3}{10}$  and the probability that it is green is  $\frac{7}{15}$ .

Find the ratio of orange to purple to green counters.

$$O : P : G$$

$$: \quad \frac{3}{10} \quad \frac{7}{15}$$

$$\frac{30}{30} = \frac{7}{30} : \frac{9}{30} : \frac{14}{30}$$

(a) ..... 7 ..... : 9 ..... : 14 ..... [3]

(b) A different box contains 42 red counters, 90 yellow counters and no other counters.

A group of students share these counters between them so that they each receive the same number of red counters and the same number of yellow counters.

There are no counters left over.

How many students could be in the group?

Give all possible answers and show your reasoning.

42... 1, 2, 3, 6, 7, 14, 21, 42

90... 1, 2, 3, 5, 6, 15, 18, 30, 45, 90

9, 10

more than 1

2, 3, 6 ✓

(b) ..... [3]

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- (b)** Buses to Ayton leave the station every 25 minutes.  
Buses to Bleeford leave the station every 40 minutes.  
Buses to both places leave at 9am.

What is the next time buses to Ayton and Bleeford leave the station together?

**(b)** ..... [4]

- (b) Buses to Ayton leave the station every 25 minutes.  
Buses to Bleeford leave the station every 40 minutes.  
Buses to both places leave at 9am.

What is the next time buses to Ayton and Bleeford leave the station together?

Ayton

25

50

75

100

125

150

175

200

Bleeford

40

80

120

160

200

$$200 \text{ min} = 3 \text{ hrs } 20 \text{ min}$$

(b)

12:20 pm

[4]

**19** Two numbers have these properties.

- Both numbers are greater than 6.
- Their highest common factor (HCF) is 6.
- Their lowest common multiple (LCM) is 60.

Find the two numbers.

..... and ..... [3]

19 Two numbers have these properties.

- Both numbers are greater than 6.
- Their highest common factor (HCF) is 6.
- Their lowest common multiple (LCM) is 60.

Find the two numbers.

Factors of 60 ... ~~1~~ and 60  
~~2~~ and 30  
~~3~~ and ~~20~~  
~~4~~ and ~~15~~  
~~5~~ and 12  
~~6~~ and ~~10~~

~~30 and 60~~  
10

..... 12 ..... and ..... 30 ..... [3]

2 (a) Write down

(i) a multiple of 13,

(a)(i) ..... [1]

(ii) a prime number between 40 and 50.

(ii) ..... [1]

(b) Find the lowest common multiple (LCM) of 16 and 28.

(b) ..... [2]

2 (a) Write down

(i) a multiple of 13,

(a)(i) 13, 26, ... [1]

(ii) a prime number between 40 and 50.



(ii) 41, 43, 47 [1]

(b) Find the lowest common multiple (LCM) of 16 and 28.

16... 16, 32, 48, 64 80 96 112

28... 28, 56, 84, 112

(b) 112 [2]



**13 (a)** Show that the highest common factor (HCF) of 18 and 63 is 9.

**[2]**

**(b)** Find the lowest common multiple (LCM) of 18 and 63.

..... **[2]**

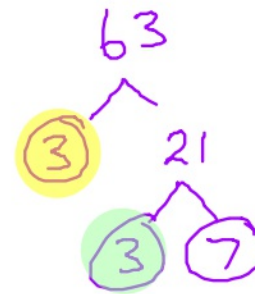
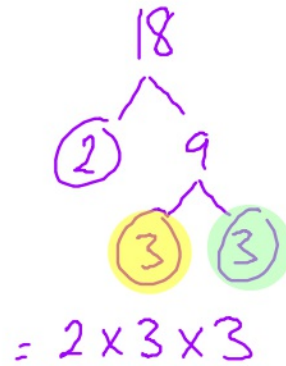
13 (a) Show that the highest common factor (HCF) of 18 and 63 is 9. [2]

N22 18

1	18	1	63
2	9	3	21
6	3	7	9

$$= 9$$

63

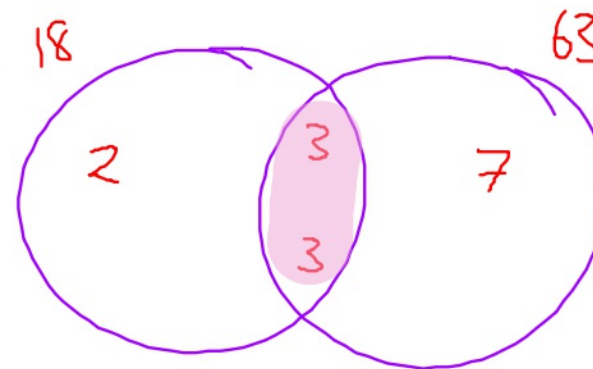


(b) Find the lowest common multiple (LCM) of 18 and 63.

N23

$$\text{HCF} = 3 \times 3 = 9$$

$$\begin{aligned} \text{LCM} &= 2 \times 3 \times 3 \times 7 \\ &= 126 \end{aligned}$$



$$126 \checkmark$$

[2]

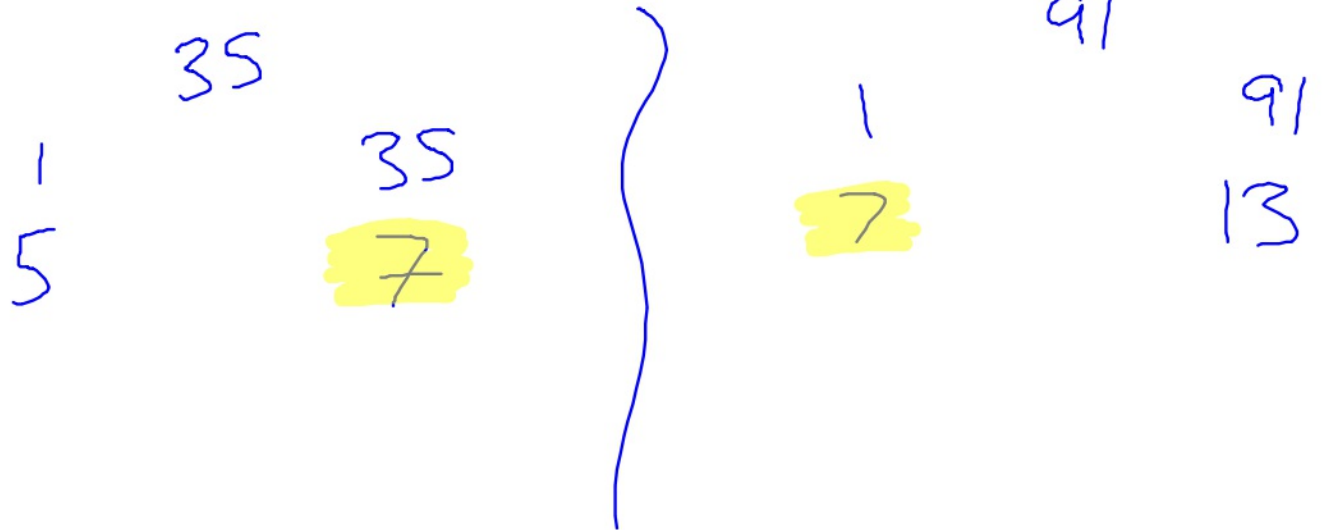
**(b)** Find the highest common factor (HCF) of 35 and 91.

N22

**(b)** ..... [2]

(b) Find the highest common factor (HCF) of 35 and 91.

N22



(b) ..... 7 ✓ ..... [2]

**18** Doctor Jones starts an appointment every 20 minutes.  
Doctor Warholm starts an appointment every 35 minutes.

**N23**

The first appointment for both doctors starts at 8.30 am.

What is the next time that they have an appointment start at the same time?

..... **[4]**

- 18 Doctor Jones starts an appointment every 20 minutes.  
 Doctor Warholm starts an appointment every 35 minutes.

N23

The first appointment for both doctors starts at 8.30 am.

+2hr 20min

What is the next time that they have an appointment start at the same time?

DJ  $\rightarrow$  20, 40, 60, 80, 100, 120, 140

DW  $\rightarrow$  35, 70, 105, 140

$\frac{140 \text{ min}}{\underline{\underline{\hspace{1cm}}}}$   
 2hrs 20min

.....10.50am ✓ [4]

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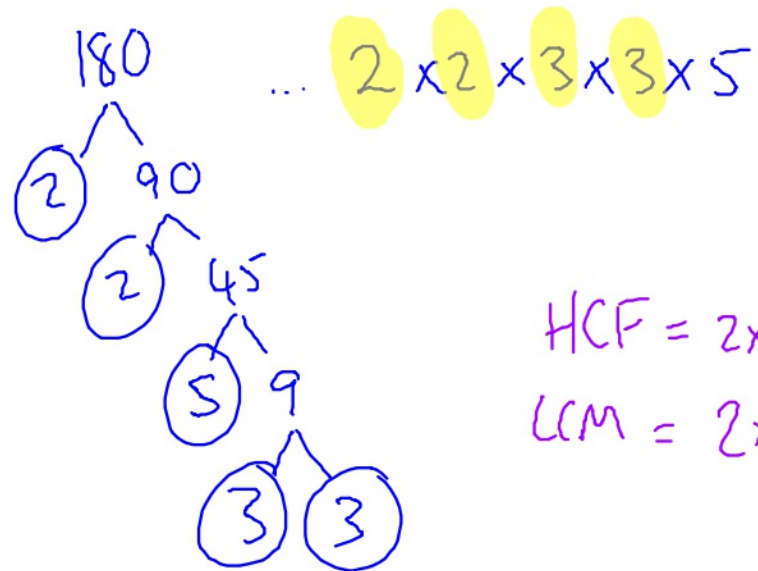
**(b)** Find the lowest common multiple (LCM) of 180 and 504.

**(b)** ..... **[2]**

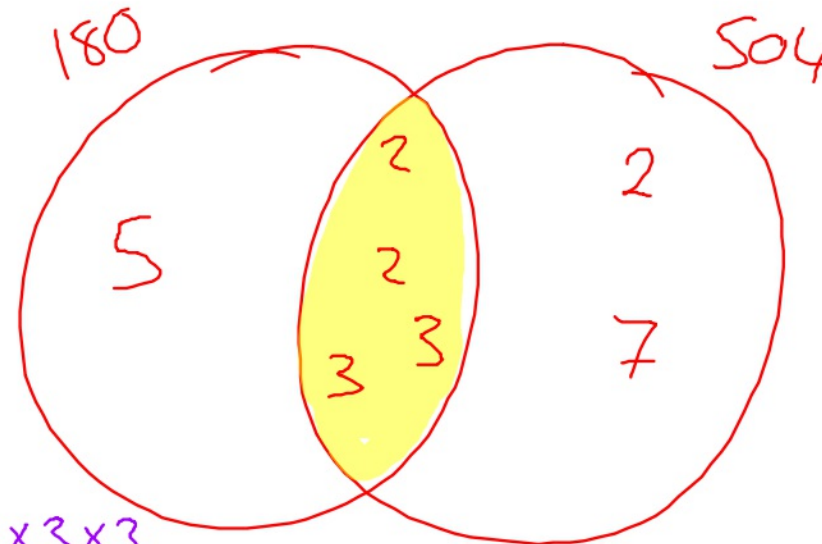
(b) Find the lowest common multiple (LCM) of 180 and 504.

N23

$$504 \dots 2 \times 2 \times 2 \times 3 \times 3 \times 7$$



$$\dots 2 \times 2 \times 3 \times 3 \times 5$$



$$\text{HCF} = 2 \times 2 \times 3 \times 3$$

$$\text{LCM} = 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 7$$

2520

(b) ..... [2]



- 2 Carla runs every 3 days.  
She swims every Thursday.  
N23 On Thursday 9 November, Carla both runs and swims.

What will be the next date on which she both runs and swims?

..... [3]

- 2 Carla runs every 3 days.  
 She swims every Thursday.  
 N23 On Thursday 9 November, Carla both runs and swims.

What will be the next date on which she both runs and swims?

+3 ↪ Runs  
 9 Nov  
 12  
 15  
 18  
 21  
 24  
 27  
 30

Swims ↻ +7  
 9 Nov  
 16<sup>th</sup>  
 23<sup>rd</sup>  
 30<sup>th</sup>

..... 30<sup>th</sup> Nov [3]

**(ii)** The lowest common multiple (LCM) of  $x$  and 120 is 360.

Find the smallest possible value of  $x$ .

**(ii)** ..... **[2]**

(ii) The lowest common multiple (LCM) of  $x$  and 120 is 360.

Find the smallest possible value of  $x$ .

Handwritten work in red ink:

1 and 120  
LCM = 120 ✓

2	3	4	5	6	7	8	9
↓	↓	↓	↓	↓	x	↓	
120	120	120	120	12		120	

90, 99, 108, 117, 126

9 and 120  
⋮  
360      360

(ii) ..... 9 ..... [2]

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**(b)** Two numbers,  $A$  and  $B$ , are written as a product of prime factors.

$$A = 2^4 \times 3^2 \times 7^2 \qquad B = 2^3 \times 3 \times 5 \times 7$$

Find the highest common factor (HCF) of  $A$  and  $B$ .

**(b)** ..... **[2]**

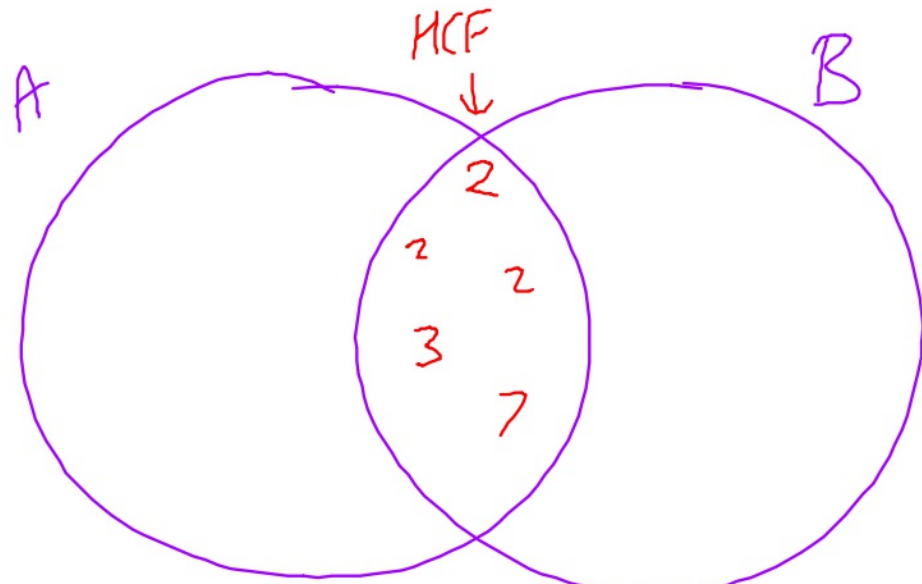
(b) Two numbers,  $A$  and  $B$ , are written as a product of prime factors.

$$A = 2^4 \times 3^2 \times 7^2 \qquad B = 2^3 \times 3 \times 5 \times 7$$

$$2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 7 \times 7$$

$$2 \times 2 \times 2 \times 3 \times 5 \times 7$$

Find the highest common factor (HCF) of  $A$  and  $B$ .



$$\text{HCF} = 2 \times 2 \times 2 \times 3 \times 7$$

$$168$$

(b) ..... [2]

8 (a) Two numbers,  $P$  and  $Q$ , are written as products of their prime factors.

$$P = 2^5 \times 3^2 \times 5^3 \times 11 \qquad Q = 2^4 \times 3 \times 5^4 \times 7$$

(i) Find the lowest common multiple (LCM) of  $P$  and  $Q$ .

N23

(a)(i) ..... [2]

$$2^5 \dots 2 \times 2 \times 2 \times 2 \times 2$$

$$2^4 \quad 2 \times 2 \times 2 \times 2$$

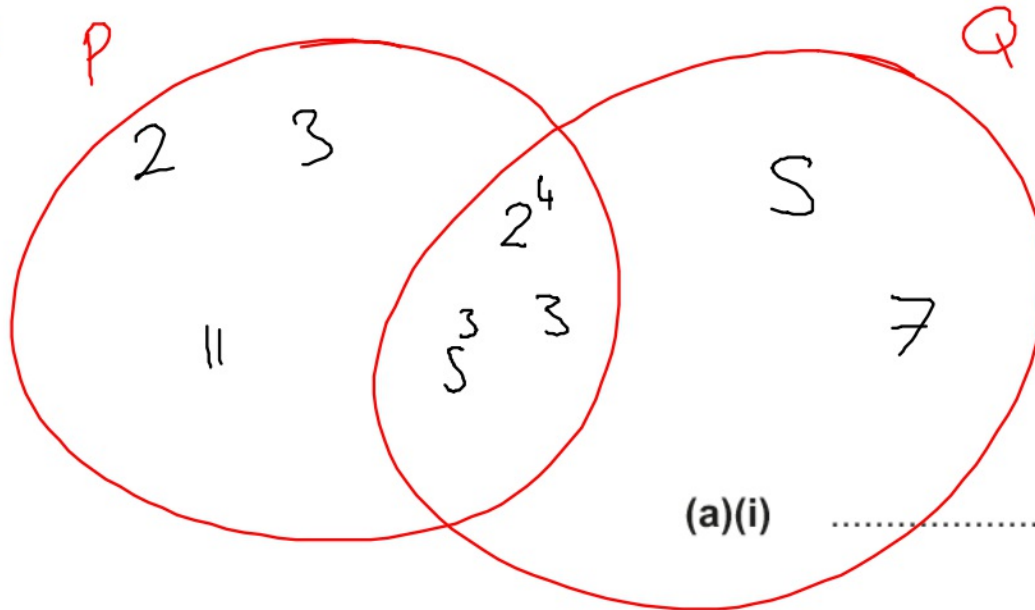
- 8 (a) Two numbers,  $P$  and  $Q$ , are written as products of their prime factors.

$$P = \underline{2}^5 \times \underline{3}^2 \times 5^3 \times 11$$

$$Q = \underline{2}^4 \times \underline{3} \times 5^4 \times 7$$

- (i) Find the lowest common multiple (LCM) of  $P$  and  $Q$ .

N23



(a)(i)

..... 13,860,000 ..... [2]



Edexcel

(b) Find the highest common factor (HCF) of 168 and 180

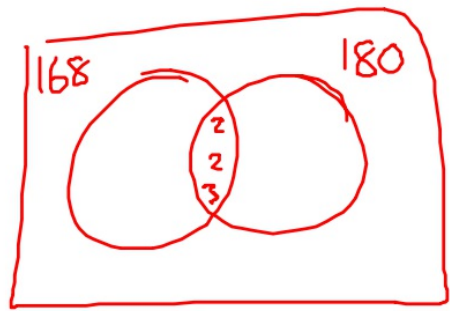
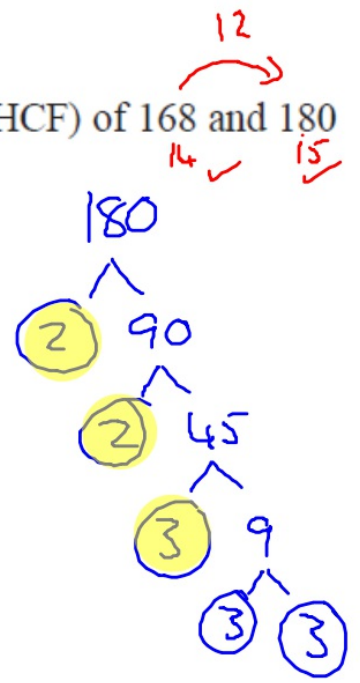
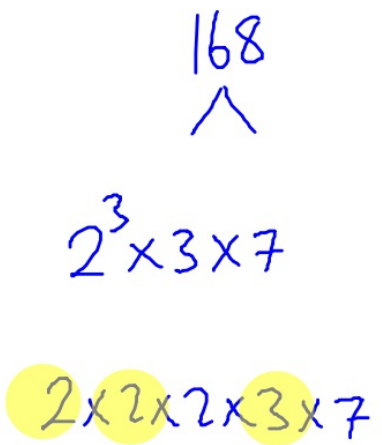
.....  
(2)

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**(Total for Question 1 is 5 marks)**

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(b) Find the highest common factor (HCF) of 168 and 180



$2 \times 2 \times 3$

12  
(2)

(Total for Question 1 is 5 marks)

**24** Simon can see two lights, light **A** and light **B**.

**N23** Light **A** flashes every 15 seconds.  
Light **B** flashes every 18 seconds.

At 10 pm, both lights flash at the same time.

How many **more** times will both lights flash at the same time in the next 4 minutes?

.....  
(Total for Question 24 is 3 marks)

24 Simon can see two lights, light **A** and light **B**.

- N23 Light **A** flashes every 15 seconds.  
Light **B** flashes every 18 seconds.

At 10 pm, both lights flash at the same time.

How many more times will both lights flash at the same time in the next 4 minutes?

A ... 15, 30, 45, 60, 75, 90

B ... 18, 36, 54, 72, 90

90 seconds = 1 min 30 sec

10:00

10:01:30 ✓

10:03 ✓

10:04:30 x

2 ✓

(Total for Question is 3 marks)

**21** (a) Find the lowest common multiple (LCM) of 40 and 56

NZ3

(a) Find the lowest common multiple (LCM) of 40 and 56

N23

40, 80, 120, 160, 200, 240, 280, 320, 360

56, 112, 168, 224, 280

280

.....  
(2)

10 Here are three lamps.

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N23

lamp A



lamp B



lamp C



Lamp A flashes every 20 seconds.  
Lamp B flashes every 45 seconds.  
Lamp C flashes every 120 seconds.

The three lamps start flashing at the same time.

How many times in one hour will the three lamps flash at the same time?

.....  
(Total for Question 10 is 3 marks)



10 Here are three lamps.

Video created by W Neill

N23

lamp A



lamp B



lamp C



Lamp A flashes every 20 seconds.  
Lamp B flashes every 45 seconds.  
Lamp C flashes every 120 seconds.

The three lamps start flashing at the same time.

How many times in one hour will the three lamps flash at the same time?

A 20, 40, 60 ... 360

B 45, 90, 135, 180, 225, 270, 315, 360

C 120, 240, 360...

360 seconds

= 60 sec = 1 min

360 sec = 6 min  
every 6 min

60 min = 1 hr

6 min = 10 times ✓

if start included  
or 11 10 times

(Total for Question 10 is 3 marks)

AQA

15

Circle the highest common factor (HCF) of  $6xy^2$  and  $4x^3y$

[1 mark]

A11  
N22

$2xy^2$

$2xy$

$12x^3y^2$

$24x^4y^3$

15

Circle the highest common factor (HCF) of  $6xy^2$  and  $4x^3y$

[1 mark]

A11  
N22

$2xy^2$

$2xy$

$12x^3y^2$

$24x^4y^3$

$6xy^2$

$4x^3y$

Highest factor

$2xy$

**4** Work out the lowest common multiple (LCM) of 20, 30 and 40  
Circle your answer.

**N23**

**[1 mark]**

10

120

240

24 000

4 Work out the lowest common multiple (LCM) of 20, 30 and 40  
Circle your answer.

N23

[1 mark]

10  
HCF

120

240

24 000

20 ✓

30 ✓

40, 80, 120