1 (a) Number line representing 1, 2, 3, 4

Additional / Missing numbers each B3

Missing arrow heads / unequal intervals / crooked line / less than 5 markings -1 -1

(b) Number line representing -3, 0, 3, 6, 9, 12

Additional / Missing numbers each B3

Missing arrow heads / unequal intervals / crooked line / less than 5 markings -1 -1

2 (a)

$$(-6)^3 \div 3^2 \div [-9-(-8)]^3 \times \sqrt[3]{64} = -216 \div 9 \div (-1)^3 \times 4$$ M4

$$= -24 \div (-1) \times 4$$

$$= 24 \times 4$$ M1

$$= 96$$ A1

M4: M1 each for correctly evaluating the 4 terms

M1: (-) divide by (-) = (+)

(b)

$$\sqrt{2.75+0.75\div\frac{12}{37}} = \sqrt{2\frac{3}{4}+\frac{3}{4}\div\frac{12}{37}}$$ B1

$$= \sqrt{\frac{11}{4}+\frac{3}{4}\times\frac{37}{12}}$$ M1

$$= \sqrt{\frac{11}{4}+\frac{37}{16}}$$

$$= \sqrt{\frac{44}{16}+\frac{37}{16}}$$

$$= \sqrt{\frac{81}{16}}$$

$$= \frac{9}{4}$$ M1

$$= 2\frac{1}{4}$$ A1

3 (a) By prime factorization, $63 = 3^2 \times 7$

$105 = 3 \times 5 \times 7$

$420 = 2^2 \times 3 \times 5 \times 7$

Thus, HCF = 3×7 M2

LCM = $2^2 \times 3^2 \times 5 \times 7$ A1

A1

(b) (i) HCF = $21ac$ B1

LCM = $1260a^5b^3c^3$ B1

/6/

(ii) We note that $210 = 2 \times 105 = 2 \times (3 \times 5 \times 7)$

$1260 = 3 \times 420 = 3 \times (2^2 \times 3 \times 5 \times 7)$

Hence, HCF of 63, 210, 1260 is the same as that of 63, 105, 420, that is, 21. B1

However, LCM of 63, 210, 1260 = $2 \times 3 \times 1260 = 7560$ B1

4 (a) For the largest possible value of L, we find the HCF of 112, 98 and 84. M1

2	112, 98, 84
7	56, 49, 42
	8, 7, 6

M1

Thus, the largest possible value of L is $2 \times 7 = 14$. A1

(b) For the smallest value of d, we find the LCM of 45, 21 and 15. M1

3	45, 21, 15
5	15, 7, 5
3	3, 7, 1
7	1, 7,1
	1, 1, 1

M1

Thus, the largest value of d is $3 \times 3 \times 5 \times 7 = 315$ A1

5 (a) By prime factorization:

2	2744
2	1372
2	686
7	343
7	49
7	7
	1

Thus, $2744 = 2^3 \times 7^3$ M1

Hence, $\sqrt[3]{2744} = 2 \times 7$ M1

$= 14$ A1

(b) By prime factorization, $198 = 2 \times 3^2 \times 11$ M1

Thus, for 198 x N to be a perfect square, it must be at least $2^2 \times 3^2 \times 11^2$ M1

Hence, N must be at least $2 \times 11 = 22$ A1

6 (a) (i) 3876 divisible by 3 since $3 + 8 + 7 + 6 = 24$ is divisible by 3. B1

(ii) 3876 is divisible by 4 since the number formed by the last 2 digits "76" is divisibe by 4. B1

(iii) 3876 is not divisible by 9 since 3 + 8 + 7 + 6 = 24 is not divisible by 9. B1

(b) By inspection, the sum of odd position digits = 1 + 5 = 6
sum of even position digits = 8 + 9 = 17
Difference = 17 – 6 = 11 (divisible by 11) M1

Thus, the number 1859 is divisible by 11. M1

Hence, 1959 cannot be a prime number. A1

7 (a) 0, 3, 8, 15, 24, 35, 48, 63, **80**, **99**. A2

(b) 1.23, 2.46, 4.92, 9.84, 19.68, **39.36**, **78.72**. A2

(c) $1, \frac{2}{3}, \frac{1}{2}, \frac{2}{5}, \frac{1}{3}, \frac{2}{7}, \frac{1}{4}, \frac{2}{9}$. A2

8 (a) -4, -5.5 and $-\frac{7}{11}$ A2

(b) 0, 6 and $\sqrt[3]{64}$ A2

(c) π and $\sqrt{2}$ A2

9 (a) [2]

Row	Number of Black Triangles	Number of White Triangles	Total Number of Triangles
1	1	0	1
2	2	1	3
3	**3**	**2**	**5**
4	**4**	**3**	**7**
5	**5**	**4**	**9**
6	**6**	**5**	**11**

B2

/63

(b) **11 black triangles** B1

(c) ***n* – 1** B1

(d) **1 + 3 + 5 = 9** B1

(e) ***n*² triangles** B1

10 (a)

$$\frac{a-(2b)^2}{2c^2-a}=\frac{4-[2(-2)]^2}{2(-3)^2-4}$$
$$=\frac{4-(-4)^2}{2(9)-4}$$
$$=\frac{4-16}{18-4}$$
$$=\frac{-12}{14}$$
$$=-\frac{6}{7}$$

[M1] Correct substitution of a, b and c, with brackets in appropriate places
[M1 each] 16 and 18
[A1] $-\frac{12}{14}$
[A1] $-\frac{6}{7}$

(b)

$yab-yax+ybk-ykx$

$=ya(b-x)+yk(b-x)$ [M1, M1]

$=(b-x)(ya+yk)$ [M2]

$=y(b-x)(a+k)$ [M1]

11 (a)

$(7t-2u-3v)+(3t+5u-8v)-(t-3v)$
$=7t-2u-3v+3t+5u-8v-t+3v$ B2
$=9t+3u-8v$ M1

A3

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(b) $7a+\{2b-[-3a-(4b-5a)+6b]+7a-8b\}$

$=7a+\{2b-[-3a-4b+5a+6b]+7a-8b\}$

$=7a+\{2b-[2a+2b]+7a-8b\}$

$=7a+\{2b-2a-2b+7a-8b\}$

$=7a+\{5a-8b\}$

$=7a+5a-8b$

$=12a-8b$

$=4(3a-2b)$

M2 for –(4b-5a)=-4b+5a
M1 for correctly simplifying "–[–……]"
M1 for simplifying to 5a-8b
M1 for getting 12a-8b
A1 for factorizing

(c) $\frac{1}{2}\left(\frac{11x}{15}+\frac{8}{5}\right)-\frac{2+x}{2}-\frac{2x-3}{5}$

$=\frac{11x}{30}+\frac{4}{5}-\frac{2+x}{2}-\frac{2x-3}{5}$

$=\frac{11x}{30}+\frac{24}{30}-\frac{30+15x}{30}-\frac{12x-18}{30}$

$=\frac{11x+24-30-15x-12x+18}{30}$

$=\frac{12-16x}{30}$

$=\frac{4(3-4x)}{30}$

$=\frac{2(3-4x)}{15}$

M1 for simplifying $\frac{1}{2}(\ldots)$
M1 for common denominator
M1 each for combining each of the fractions correctly
A2 for simplifying to 12-16x (A1 per term)
M1 for factorising
A1 for final answer.

12 (a) 35, 70, 67. A3

(b) $\dfrac{9+12+15+18+21+\ldots+297}{12+16+20+24+28+\ldots+396}$

$=\dfrac{3(3+4+5+\ldots+99)}{4(3+4+5+\ldots+99)}$ M1

$=\dfrac{3}{4}$ A2

(c) (i)

$(2*7)=\dfrac{7+2}{7-2}$

$=\dfrac{9}{5}$

$=1\dfrac{4}{5}$ B1

(ii)

$(2*7)*(1*5)=\dfrac{9}{5}*\dfrac{5+1}{5-1}$

$=\dfrac{9}{5}*\dfrac{6}{4}$ B1

$=\dfrac{\frac{6}{4}+\frac{9}{5}}{\frac{6}{4}-\frac{9}{5}}$ B1

$=\dfrac{30+36}{30-36}$

$=\dfrac{66}{-6}$

$=-11$ B1

B (a) Accept any logical method.
Answer is 2 x 2 x 7 x 19 = 532 B6

(b) Accept any logical method.

$2^1=2$

$2^2=4$

$2^3=8$

$2^4=16$

$2^5=32$

$2008\div 4=502$ remainder 0
Thus unit digit is 6 B4

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