1. Sequences: Arithmetic sequences

1. Which of the following sequences are the first four terms of an arithmetic sequence? For those that are, write down the value of the common difference.
(a) $7, 10, 13, 16$
(b) $3, 5, 9, 15$
(c) $1, 0.1, 0.01, 0.001$
(d) $4, 2, 0, -2$
(e) $2, -3, 4, -5$
(f) $p - 2q, p - q, p, p + q$
(g) $x, 2x, 3x, 4x$

2. Write down the sixth term and an expression for the rth term of the arithmetic sequences which begin as follows.
(a) $2, 4, 6$
(b) $1, 1\frac{1}{2}, 2$
(c) $1 - x, 1, 1 + x$

3. In the following arithmetic progressions, the first three terms and the last term are given. Find the number of terms.
(a) $4, 5, 6, \ldots, 17$
(b) $2\frac{1}{8}, 3\frac{1}{4}, 4\frac{3}{8}, \ldots, 13\frac{3}{8}$
(c) $1 - 2x, 1 - x, 1, \ldots, 1 + 25x$

4. In each of the following arithmetic sequences you are given two terms. Find the first term and the common difference.
(a) 4th term = 15, 9th term = 35
(b) 5th term = 2, 11th term = -13
(c) 3rd term = -3, 7th term = 5
(d) 3rd term = $2p + 7$, 7th term = $4p + 19$

5. For an arithmetic sequence $u_3 = 30$ and $u_9 = 9$. Find the first negative term in the sequence.

6. The first three terms of an arithmetic sequence are $5p, 20$ and $3p$, where p is a constant. Find the 20th term in the sequence.

7. The first three terms of an arithmetic sequence are $-8, k^2, 17k$, ... Find two possible values of k.

8. An arithmetic sequence has first term k^2 and common difference k, where $k > 0$. The fifth term of the sequence is 41. Find the value of k, giving your answer in the form $p + q\sqrt{5}$, where p and q are integers to be found.

9. The nth term of an arithmetic sequence is $u_n = \ln a + (n-1)\ln b$, where a and b are integers, $u_3 = \ln 16$ and $u_7 = \ln 256$. Find the values of a and b.

6. Sequences: Arithmetic sequences

1. Which of the following sequences are the first four terms of an arithmetic sequence? For those that are, write down the value of the common difference.
(a) $7, 10, 13, 16$ Yes, 3
(b) $3, 5, 9, 15$ No
(c) $1, 0.1, 0.01, 0.001$ No
(d) $4, 2, 0, -2$ Yes, -2
(e) $2, -3, 4, -5$ No
(f) $p-2q, p-q, p, p+q$ Yes, q
(g) $x, 2x, 3x, 4x$ Yes, x

2. Write down the sixth term and an expression for the rth term of the arithmetic sequences which begin as follows.
(a) $2, 4, 6$ $12, 2r$
(b) $1, 1\frac{1}{2}, 2$ $3\frac{1}{2}, \frac{1}{2}+\frac{1}{2}r$
(c) $1-x, 1, 1+x$ $1+4x, 1-2x+xr$

3. In the following arithmetic progressions, the first three terms and the last term are given. Find the number of terms.
(a) $4, 5, 6, \ldots, 17$ 14
(b) $2\frac{1}{8}, 3\frac{1}{4}, 4\frac{3}{8}, \ldots, 13\frac{3}{8}$ 11
(c) $1-2x, 1-x, 1, \ldots, 1+25x$ 28

4. In each of the following arithmetic sequences you are given two terms. Find the first term and the common difference.
(a) 4th term = 15, 9th term = 35 $a=3, d=4$
(b) 5th term = 2, 11th term = -13 $a=12, d=-2.5$
(c) 3rd term = -3, 7th term = 5 $a=-7, d=2$
(d) 3rd term = $2p+7$, 7th term = $4p+19$ $a=p+1, d=\frac{1}{2}p+3$

5. For an arithmetic sequence $u_3 = 30$ and $u_9 = 9$. Find the first negative term in the sequence. -1.5

6. The first three terms of an arithmetic sequence are $5p, 20$ and $3p$, where p is a constant. Find the 20th term in the sequence. -70

7. The first three terms of an arithmetic sequence are $-8, k^2, 17k$, ... Find two possible values of k. $\frac{1}{2}$ or 8

8. An arithmetic sequence has first term k^2 and common difference k, where $k > 0$. The fifth term of the sequence is 41. Find the value of k, giving your answer in the form $p+q\sqrt{5}$, where p and q are integers to be found. $k=-2+3\sqrt{5}$

9. The nth term of an arithmetic sequence is $u_n = \ln a + (n-1)\ln b$, where a and b are integers, $u_3 = \ln 16$ and $u_7 = \ln 256$. Find the values of a and b. $a=4, b=2$