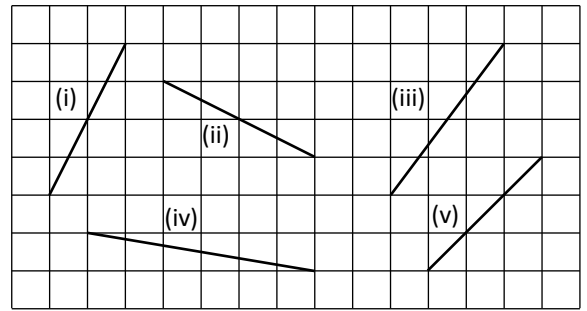Lesmahagow High School

Mathematics Department

S3 Gradient

DETERMINING the GRADIENT of a STRAIGHT LINE given TWO POINTS

1.   **(a)**   Calculate the gradient of each line

in the diagram opposite.

(b)   **Copy** and complete each statement below:

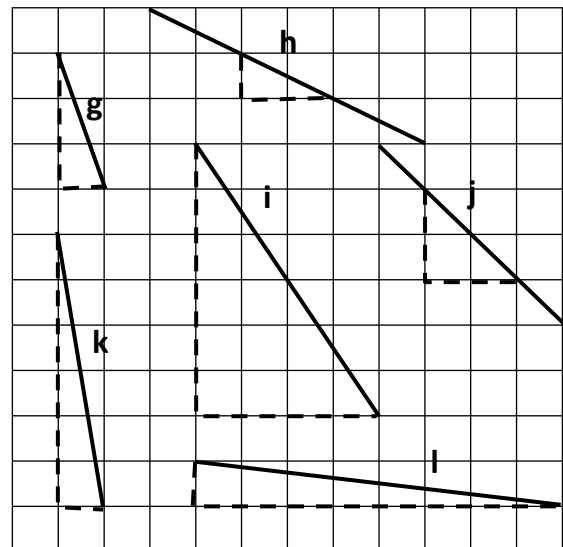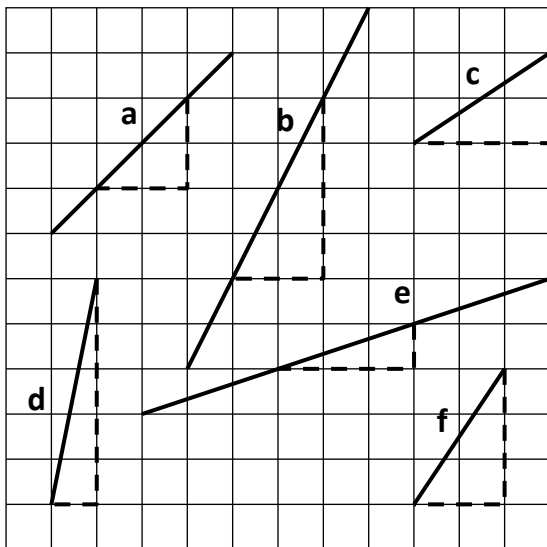*The gradient of any horizontal line is* _____ .

The gradient of any vertical line is _____.

A line sloping upwards from left to right has a _____ *gradient.*

A line sloping upwards from right to left has a _____ *gradient.*

2.   Find the **gradients** of the lines shown in each of the diagrams below:

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4. Calculate the gradient of the line joining each pair of points below:

(a) (2, 1) and (6, 3)   **(b)** (1, 5) and (3, 1)   **(c)** (2, 0) and (4, 6)

(d) (4, 3) and (8, 11)   **(e)** (1, 9) and (3, 1)   **(f)** (7, 3) and (5, 2)

(g) (−2, −3) and (2, 3)   **(h)** (−1, 2) and (5, −1)   **(i)** (−4, 2) and (4, −4)

(j) (−6, −2) and (−5, 3)   **(k)** (4, −3) and (6, 5)   **(l)** (−2, 3) and (0, −2)

5. Calculate the gradient of the line joining each pair of points below:

(a) A(−2, 6) and B(8, 8)   **(b)** C(3, −3) and D(4, −1)

(c) E(5, −9) and F(8, −15)   **(d)** G(0, 6) and H(5, 11)

(e) I(−1, −3) and J(7, −9)   **(f)** K(−4, 0) and L(−1, 5)

(g) M(2, 2) and N(−3, 4)   **(h)** P(5, −1) and Q(−2, 10)

(i) R(−3, −5) and S(8, −4)   **(j)** T(4, −6) and U(7, −2)

(k) V(5, −6) and W(−2, 6)   **(l)** X(−1, 7) and Y(−2, 6)

(m) J(6, 8) and K(−3, −5)   **(n)** S(3, −5) and T(−2, 8)

(o) D(6, −3) and E(0, 4)   **(p)** F(6, 9) and G(−5, −5)

6. Prove that the following sets of points are collinear:

(a) A(−6,−1), B(2, 3) and C(4, 4)

(b) P(1, −1), Q(−3, 5) and R(7, −10)

(c) E(5, −3), F(11, −2) and G(−7, −5)

(d) K(5, −4), L(−1, 4) and M(9½ , −10)

7. Given that each set of points are collinear, find the value of k in each case:

(a) P(−4, −2), Q(−1, −1) and R(8, k)

(b) A(1, 3), B(3, k) and C(4, −6)

(c) E(−4, −1), F(k, −1) and G(8, 7)

(d)   S(k, 2), T(9, 1) and U(−3, 4)

8.   The points E and F have coordinates (2, −5) and (−4, a) respectively.
Given that the gradient of the line EF is $\frac{2}{3}$, find the value of a .

9.   If the points   (3, 2) , (−1, 0) and (4, k) are collinear, find k .

10.   Given that the points   (3, −2), (4, 5) and (−1, a) are collinear , find the value of a.

11.   The line which passes through (1, 4) and (2, 5) is parallel to the line through (3, 7) and (k, 5). Find the value of k.

12.   The line which passes through (−2, 3) and (−5, −9) is parallel to the line through (4, k) and (−1, −1). Find the value of k.

DETERMINING the GRADIENT of a STRAIGHT LINE given TWO POINTS

1.   **(a)**   **(i)**   2   **(ii)** $-\frac{1}{2}$ **(iii)** $\frac{4}{3}$ **(iv)** $-\frac{1}{6}$ **(v)**   **1**

     (b)   0; undefined; positive; negative

2.   **(a)**   1   **(b)**   2   **(c)** $\frac{2}{3}$ **(d)**   **5**   **(e)** $\frac{1}{3}$ **(f)** $\frac{3}{2}$

     (g) -3 **(h)** $-\frac{1}{2}$ **(i)** $-\frac{3}{2}$ **(j)** -1 **(k)** -6 **(l)** $-\frac{1}{8}$

3.   **(a)** -3 **(b)** $\frac{1}{2}$ **(c)**   1   **(d)** $-\frac{1}{2}$ **(e)** $\frac{2}{5}$ **(f)**   4

4.   **(a)** $\frac{1}{2}$ **(b)** -2 **(c)**   3   **(d)**   2   **(e)** -4 **(f)** $\frac{1}{2}$

     (g) $\frac{3}{2}$ **(h)** $-\frac{1}{2}$ **(i)** $-\frac{3}{4}$ **(j)**   5   **(k)**   4   **(l)** $-\frac{5}{2}$

5.   **(a)** $\frac{1}{5}$ **(b)**   2   **(c)** -2 **(d)**   1   **(e)** $-\frac{3}{4}$ **(f)** $\frac{5}{3}$

     (g) $-\frac{2}{5}$ **(h)** $-\frac{11}{7}$ **(i)** $\frac{1}{11}$ **(j)** $\frac{4}{3}$ **(k)** $-\frac{12}{7}$ **(l)**   1

     (m) $\frac{13}{9}$ **(n)** $-\frac{13}{5}$ **(o)** $-\frac{7}{6}$ **(p)** $\frac{14}{11}$

6.   **(a)**   both gradients $\frac{1}{2}$ **(b)**   both gradients $-\frac{3}{2}$

     (c)   both gradients $\frac{1}{6}$ **(d)**   both gradients $-\frac{4}{3}$

7.   **(a)** $k = 2$ **(b)** $k = -3$ **(c)** $k = -4$ **(d)** $k = 5$

8. $a = -9$ **9.** $k = 2{\cdot}5$ **10.** $a = -30$ **11.** $k = 1$ **12.** $k = 19$