

Geometry Non Calculator C Grade

1. Here are two statements about the points $S(2,3)$ and $T(5,-1)$:

- I. The length of $ST = 5$ units;
- II. The gradient of $ST = \frac{4}{3}$.

Which of the following is true?

- A. neither statement is correct
- B. only statement I is correct
- C. only statement II is correct
- D. both statements are correct

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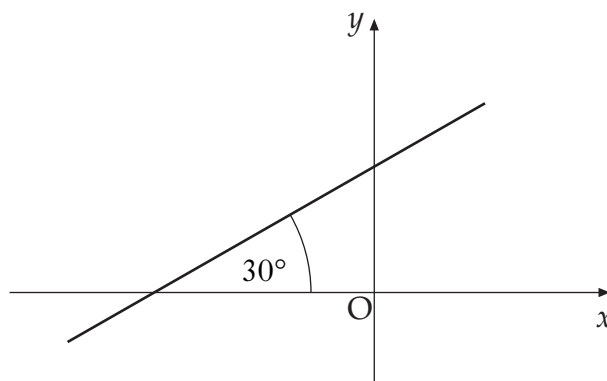
2. A line l has equation $3y + 2x = 6$.

What is the gradient of any line parallel to l ?

- A. -2
- B. $-\frac{2}{3}$
- C. $\frac{3}{2}$
- D. 2

2

3. A line makes an angle of 30° with the positive direction of the x -axis as shown.

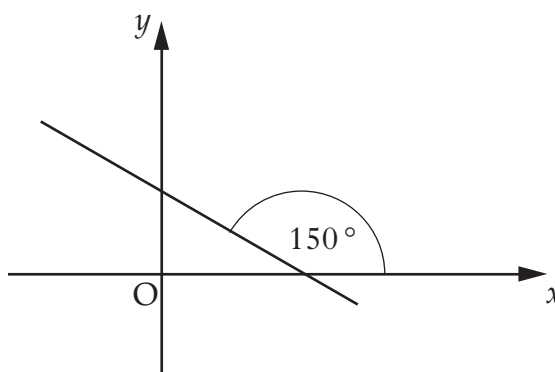


What is the gradient of the line?

- A. $\frac{1}{\sqrt{3}}$
- B. $\frac{1}{\sqrt{2}}$
- C. $\frac{1}{2}$
- D. $\frac{\sqrt{3}}{2}$

2

4. What is the gradient of the line shown in the diagram?

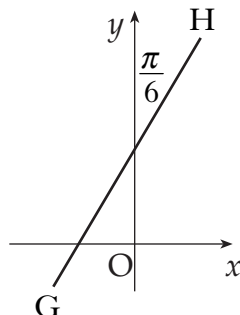


- A. $-\sqrt{3}$
- B. $-\frac{1}{\sqrt{3}}$
- C. $-\frac{1}{2}$
- D. $-\frac{\sqrt{3}}{2}$

2

5. The line GH makes an angle of $\frac{\pi}{6}$ radians with the y -axis, as shown in the diagram.

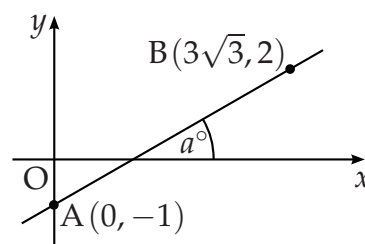
What is the gradient of GH?



- A. $\sqrt{3}$
 B. $\frac{1}{2}$
 C. $\frac{1}{\sqrt{2}}$
 D. $\frac{\sqrt{3}}{2}$

2

- [SQA] 6. Find the size of the angle a° that the line joining the points A(0, -1) and B($3\sqrt{3}$, 2) makes with the positive direction of the x -axis.



3

7. A line L is perpendicular to the line with equation $2x - 3y - 6 = 0$.

What is the gradient of the line L?

- A. $-\frac{3}{2}$
 B. $-\frac{1}{2}$
 C. $\frac{2}{3}$
 D. 2

2

8. Triangle PQR has vertices at $P(-3, -2)$, $Q(-1, 4)$ and $R(3, 6)$.

PS is a median. What is the gradient of PS?

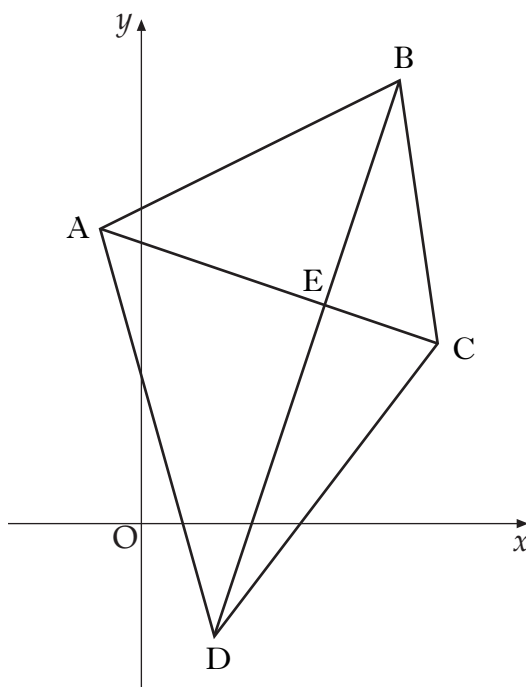
- A. -2
 B. $-\frac{7}{4}$
 C. 1
 D. $\frac{7}{4}$

2

- [SQA] 9. Find the equation of the straight line which is parallel to the line with equation $2x + 3y = 5$ and which passes through the point $(2, -1)$.

3

- [SQA] 10. A quadrilateral has vertices $A(-1, 8)$, $B(7, 12)$, $C(8, 5)$ and $D(2, -3)$ as shown in the diagram.



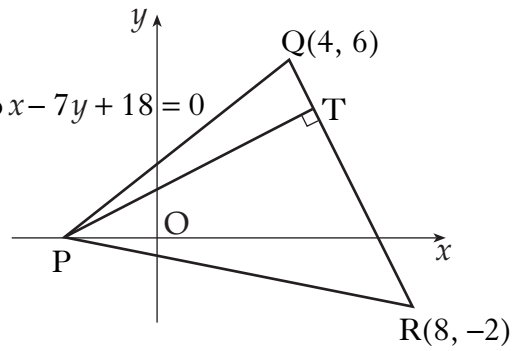
- (a) Find the equation of diagonal BD. 2
- (b) The equation of diagonal AC is $x + 3y = 23$.
 Find the coordinates of E, the point of intersection of the diagonals. 3
- (c) (i) Find the equation of the perpendicular bisector of AB.
 (ii) Show that this line passes through E. 5

[SQA] 11. Triangle PQR has vertex P on the x -axis, as shown in the diagram.

Q and R are the points $(4, 6)$ and $(8, -2)$ respectively.

The equation of PQ is $6x - 7y + 18 = 0$.

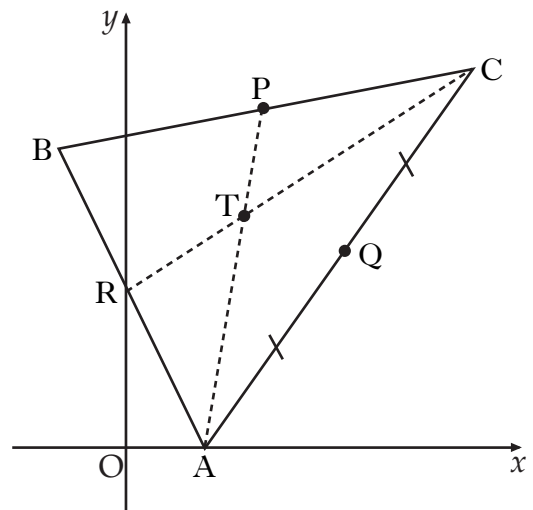
- (a) State the coordinates of P.
- (b) Find the equation of the altitude of the triangle from P.
- (c) The altitude from P meets the line QR at T. Find the coordinates of T.



1
3
4

12. Triangle ABC has vertices $A(4, 0)$, $B(4, 16)$ and $C(18, 20)$, as shown in the diagram opposite.

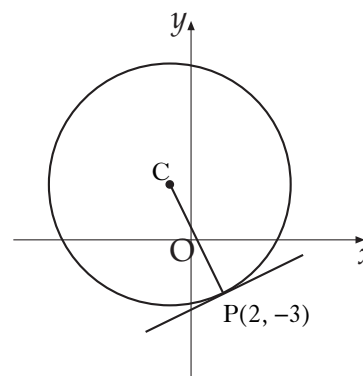
Medians AP and CR intersect at the point $T(6, 12)$.



- (a) Find the equation of median BQ.
- (b) Verify that T lies on BQ.
- (c) Find the ratio in which T divides BQ.

3
1
2

13. The point $P(2, -3)$ lies on the circle with centre C as shown. The gradient of CP is -2 . What is the equation of the tangent at P ?



- A. $y + 3 = -2(x - 2)$
 B. $y - 3 = -2(x + 2)$
 C. $y + 3 = \frac{1}{2}(x - 2)$
 D. $y - 3 = \frac{1}{2}(x + 2)$

2

- [SQA] 14. The point $P(2, 3)$ lies on the circle $(x + 1)^2 + (y - 1)^2 = 13$. Find the equation of the tangent at P .

4

15. The line with equation $y = 2x$ intersects the circle with equation $x^2 + y^2 = 5$ at the points J and K .

What are the x -coordinates of J and K ?

- A. $x_J = 1, x_K = -1$
 B. $x_J = 2, x_K = -2$
 C. $x_J = 1, x_K = -2$
 D. $x_J = -1, x_K = 2$

2

16. A circle has equation $x^2 + y^2 + 8x + 6y - 75 = 0$.

What is the radius of the circle?

- A. 5
 B. 10
 C. $\sqrt{75}$
 D. $\sqrt{175}$

2

[SQA] 17. Circle P has equation $x^2 + y^2 - 8x - 10y + 9 = 0$. Circle Q has centre $(-2, -1)$ and radius $2\sqrt{2}$.

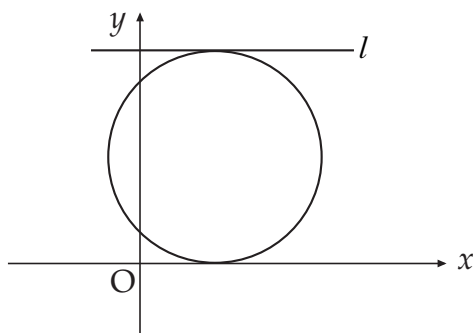
(a) (i) Show that the radius of circle P is $4\sqrt{2}$.

(ii) Hence show that circles P and Q touch. 4

(b) Find the equation of the tangent to the circle Q at the point $(-4, 1)$. 3

(c) The tangent in (b) intersects circle P in two points. Find the x -coordinates of the points of intersection, expressing your answers in the form $a \pm b\sqrt{3}$. 3

18. The equation of the circle shown in the diagram is $x^2 + y^2 - 6x - 10y + 9 = 0$. The x -axis and the line l are parallel tangents to the circle.



What is the equation of line l ?

A. $y = 5$

B. $y = 10$

C. $y = 18$

D. $y = 20$ 2

19. If $\mathbf{u} = k \begin{pmatrix} 3 \\ -1 \\ 0 \end{pmatrix}$, where $k > 0$ and \mathbf{u} is a unit vector, determine the value of k .

A. $\frac{1}{2}$

B. $\frac{1}{8}$

C. $\frac{1}{\sqrt{2}}$

D. $\frac{1}{\sqrt{10}}$ 2

20. The vector u has components $\begin{pmatrix} -3 \\ 0 \\ 4 \end{pmatrix}$.

Which of the following is a unit vector parallel to u ?

A. $-\frac{3}{5}\mathbf{i} + \frac{4}{5}\mathbf{k}$

B. $-3\mathbf{i} + 4\mathbf{k}$

C. $-\frac{3}{\sqrt{7}}\mathbf{i} + \frac{4}{\sqrt{7}}\mathbf{k}$

D. $-\frac{1}{3}\mathbf{i} + \frac{1}{4}\mathbf{k}$

2

21. Given that $p = \begin{pmatrix} 2 \\ 5 \\ -7 \end{pmatrix}$, $q = \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix}$ and $r = \begin{pmatrix} -4 \\ 2 \\ 0 \end{pmatrix}$, express $2p - q - \frac{1}{2}r$ in component form.

A. $\begin{pmatrix} 1 \\ 9 \\ -15 \end{pmatrix}$

B. $\begin{pmatrix} 1 \\ 11 \\ -13 \end{pmatrix}$

C. $\begin{pmatrix} 5 \\ 9 \\ -13 \end{pmatrix}$

D. $\begin{pmatrix} 5 \\ 11 \\ -15 \end{pmatrix}$

2

22. Given that $u = \begin{pmatrix} 2 \\ 0 \\ 1 \end{pmatrix}$ and $v = \begin{pmatrix} -1 \\ 2 \\ 4 \end{pmatrix}$, find $3u - 2v$ in component form.

A. $\begin{pmatrix} 4 \\ -1 \\ -5 \end{pmatrix}$

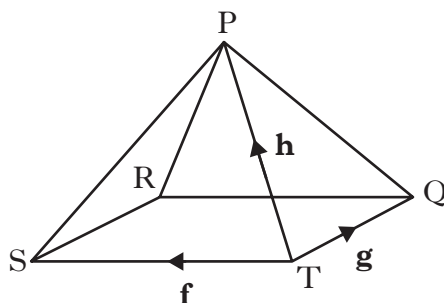
B. $\begin{pmatrix} 4 \\ -4 \\ 11 \end{pmatrix}$

C. $\begin{pmatrix} 8 \\ -1 \\ 5 \end{pmatrix}$

D. $\begin{pmatrix} 8 \\ -4 \\ -5 \end{pmatrix}$

2

23. The diagram shows a square-based pyramid PQRST. \vec{TS} , \vec{TQ} and \vec{TP} represent f , g and h respectively.



Express \vec{RP} in terms of f , g and h .

A. $-f + g - h$

B. $-f - g + h$

C. $f - g - h$

D. $f + g + h$

2

[SQA] 24. D, E and F have coordinates $(10, -8, -15)$, $(1, -2, -3)$ and $(-2, 0, 1)$ respectively.

(a) (i) Show that D, E and F are collinear.

(ii) Find the ratio in which E divides DF. 4

(b) G has coordinates $(k, 1, 0)$.

Given that DE is perpendicular to GE, find the value of k . 4

25. Given that the points $S(-4, 5, 1)$, $T(-16, -4, 16)$ and $U(-24, -10, 26)$ are collinear, calculate the ratio in which T divides SU.

A. 2 : 3

B. 3 : 2

C. 2 : 5

D. 3 : 5 2

[SQA] 26. The point Q divides the line joining $P(-1, -1, 0)$ to $R(5, 2, -3)$ in the ratio 2 : 1.

Find the coordinates of Q. 3

[SQA] 27. VABCD is a pyramid with a rectangular base ABCD.

Relative to some appropriate axes,

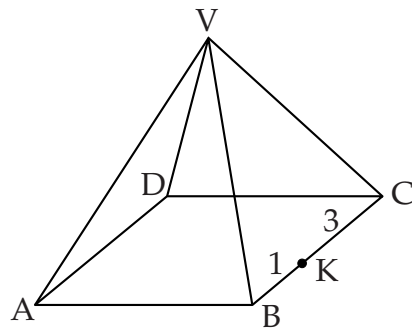
\vec{VA} represents $-7i - 13j - 11k$

\vec{AB} represents $6i + 6j - 6k$

\vec{AD} represents $8i - 4j + 4k$.

K divides BC in the ratio 1 : 3.

Find \vec{VK} in component form. 3



28. If $u = \begin{pmatrix} -3 \\ 1 \\ 2t \end{pmatrix}$ and $v = \begin{pmatrix} 1 \\ t \\ -1 \end{pmatrix}$ are perpendicular, what is the value of t ?

A. -3

B. -2

C. $\frac{2}{3}$

D. 1 2

29. The vectors $xi + 5j + 7k$ and $-3i + 2j - k$ are perpendicular.

What is the value of x ?

A. 0

B. 1

C. $\frac{4}{3}$

D. $\frac{10}{3}$

2

30. Given that $a = \begin{pmatrix} 3 \\ 4 \\ 0 \end{pmatrix}$ and $a \cdot (a + b) = 7$, what is the value of $a \cdot b$?

A. $\frac{7}{25}$

B. $-\frac{18}{5}$

C. -6

D. -18

2

[END OF QUESTIONS]