TOPICAL MODULE

ALGEBRAIC COMPONENT

TOPICS	2003		2004		2005		2006		2007	
	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2
Functions	6	0	9	0	8	0	4	6	7	0
Quadratic Equations	3	0	2	0	3	0	3	0	4	0
Quadratic Functions	3	8	6	0	6	0	5	0	6	0
Simultaneous Equation	0	5	0	5	0	5	0	5	0	5
Indices & Logarithms	8	0	9	0	10	0	9	0	7	0
Progressions	7	0	9	8	8	6	7	7	8	7
Linear Law	4	10	3	10	4	10	4	10	3	10
Total Marks By Paper	31	23	38	23	39	21	32	28	35	22
TOTAL MARKS	54		61		60		60		57	

FUNCTIONS

Paper 1

1. Given the function $g: x \to 5x+3$. Find the value of p ,if g(3)=4p+ 2 .

2. Given the function $h: x \to \dfrac{2x-3}{x+1}, x \neq -1$. Find the function of $h^{-1}(x)$.

3. Given the function $f(x) = 2x+3$ and $g(x) = \dfrac{4}{3-x}, x \neq 3$. Find the composite function of gf .

4. Given the function $f(x) = \dfrac{6}{x+1}, x \neq -1$. Find an expression for the function of $f^2(x)$.

5. Given the function $g^{-1}(x) = 6x + \dfrac{5}{x}, x \neq 0$. Find the value of $g^{-1}(10)$.

6. Given the function $f(x) = x-3$ and $gf(x) = 2x-5$. Find the function of g .

7. Given the function $f(x) = x+5$ and $g(x) = 5-3x$. Find the value of $gf(-1)$.

8. Given the function $f(x) = x + 3$ and $g(x) = ax^2 + b$. If $gf(x) = 2x^2 + 12x + 13$, find the value of a and b .

9. Given the function $g(x) = px + q$ with p and q being constants. Find the value of p and q if $g(-2) = -9$ and $g^{-1}(7) = 6$.

10. Given the function $f(x) = 3x + 2$ and $g(x) = x^2 - 3$, Find the composite function of fg .

11. Given the function $f(x) = 4x - 5$. Find the value of p if $f(2p) = p$.

12. given the function $g(x) = px + q$ with p and q being constants. If g(4)= 5 and g(-6)= 0, find the value of p and q .

13. Given the function $g : x \to 2x - 1$ and other function f with condition that $gf(x) = 2x^2 + 5$. Find the function f .

14. Find the range of the function $f(x) = |2x + 1|$ for the domain $-1 \le x \le 1$.

15. Given the function $f : x \to 3x - 4$ and $g : x \to 2x - p$. Find the value of p if $gf(3) = 8$.

16. Given the function $f(x) = 4x - 3$. Find the value of x , if $f^2(x) = f(x)$.

17. Given the function $f(x) = 3x + 2$ and $f^{-1}g(x) = \dfrac{2x - 7}{3}$. Find the function of g .

18. Find the range of x for $|1 - 2x| < 11$.

19. Given the function $f(x) = |4x - 3| = 6$. Find the possible values of x .

20. Given the function $f(x) = 2x + 3$ and $g(x) = 5x - 2$. Find the value of x, if $f^2 = g^2$.

21. Given the function $f(x) = \dfrac{x + 15}{x + 3}, x \neq -3$. Find the value of x in which it maps to itself.

22. Given the function $g(x)=4-3x$ and $fg^{-1}(x)=\frac{23-2x}{3}$. Find the function of f .

23. Given the function , $f(x)=\frac{2(x+3)}{x-3}, x \neq k$. Find

a. the value of k .
b. the positive value of p given that $f(p)=p$
c. $f^{-1}(x)$

24. Given the function $f: x \rightarrow x+3$ and the other function g . If $gf: x \rightarrow x^2+6x+2$, find
a. the function g .
b. fg(-2)
c. the value of x given that fg(x) = 3x.

25. Given the function $f(x)=2x+3$ and $g(x)=hx^2-k$. If $gf: x \rightarrow 12x^2+36x+23$, find
a. the value of h and k .
b. the value of fg (1)
c. the value of k if $f(k)=k^2$.

Paper 2

1. The function g is defined by $g: x \to x+3$ and the function f is such that $fg: x \to x^2 + 6x + 7$.
Find
a. the function f,
b. the values of k for which $f(2k) = 8k + 30$.

2. A quadratic functions f is defined by $f(x) = x^2 - 4x - 5$. Sketch the graph of function $f(x)$.

3. a. Given the function f and g are defined by $f: x \to 6x - 5$ and $g: x \to x^2 + 4$, find the value of x for which $f(x) = g(x)$.

b.

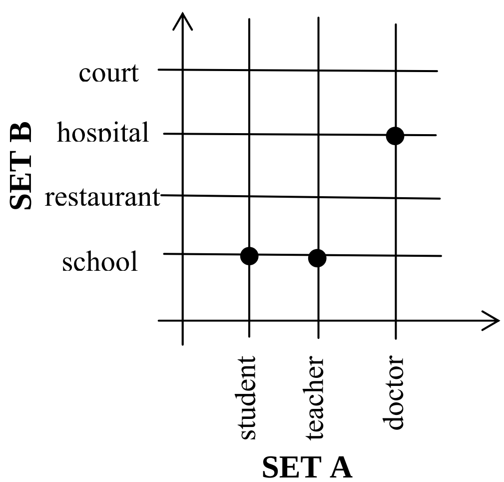


Diagram 1

The diagram 1 above shows the relation between Set C and Set D.
State the
i. domain of this relation,
ii. range of this relation.

4. a. Given that $f(x)=9x+4$ and $g(x)=3x+8$. Find

i. $fg^{-1}(x)$,

ii. the value of x such that $gf(-x)=23$.

b.

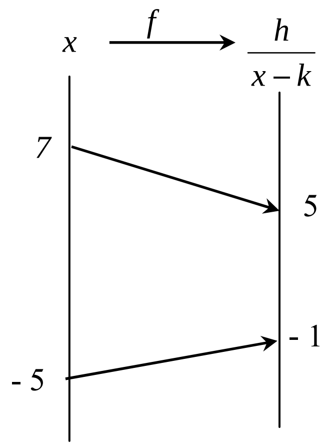


Diagram 2

The above arrow in Diagram 4 represents a function $f:x\to\frac{h}{x-k}$.

Find

i. the value of h and of k,

ii. the value of m such that $f(m)=\frac{5}{3}m$.

5. a. Given the function $f:x\to p-qx$. Find

i. $f^{-1}(x)$ in terms of p and q,

ii. the value of p and of q if $f^{-1}(8)=-1$ and $f(4)=-2$.

b. Functions f and g are define by $f:x\to 3x-9$ and $g:x\to 2x+3$. Find $f^{-1}g^{-1}$.

6. a. In Diagram 1, set A shows the images of certain elements of set B

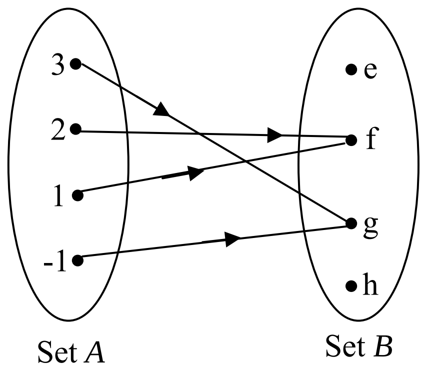


Diagram 3

i. State the type of relation between set A and set B

ii. The range of the relation

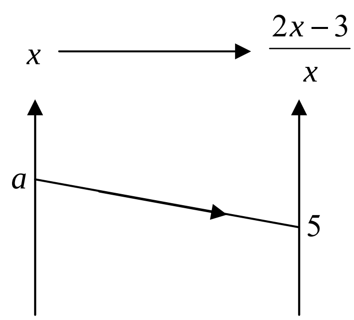


Diagram 4

b. Diagram 2 shows the function $f : x \to \dfrac{2x-3}{x}, x \neq 0$, find the value of a

7. a. Given that $f^{-1}: x \to \frac{1}{x} + 2$, $x \neq 0$, and $f: x \to \frac{a}{x+b}$, $x \neq -b$, where a and b are constants, find the values of a and b.

b. Diagram 2 shows the function $g: x \to \frac{m-x}{2}$,

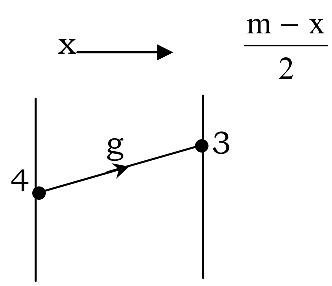


Diagram 5

Find value of m

8. a. Given the functions $g: x \to 2x - 1$ and $gf: x \to 6x + 7$, find the function f .

b. Given the functions $h: x \to 3x + 1$ and $hf: x \to 7 - 9x^2$, find the function f .

c. Given that $g: x \to m + 3x$ and $g^{-1}: x \to 2kx - \frac{4}{3}$, find the values of m and k..

9. a. Given the inverse function $f^{-1}(x) = \frac{2x-3}{2}$, find

i. the value of f(4),

ii. the value of k if $f^{-1}(2k) = -k - 3$.

b. Given that $g(x) = mx + n$ and $g^2(x) = 16x - 25$, find the values of m and n.

10. a. Given the function $f : x \rightarrow 2x - 1$ and $g : x \rightarrow \frac{x}{3} - 2$, find

i. $f^{-1}g(x)$,

ii. $h(x)$ such that $hg(x) = 6x - 3$.

b. Diagram 6 shows the function $g : x \rightarrow \frac{p + 3x}{x - 2}$, $x \neq 2$, where p is a constant.

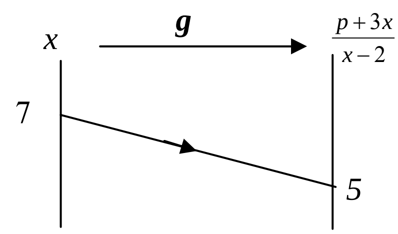


Diagram 6

Find the value of p.

QUADRATIC EQUATIONS

Paper 1

1. Given that 4 is a root of the quadratic equation $2x^2 - 5x + p = 0$, find the value of p .

2. Solve the equation , $\dfrac{x^2 + 6}{5} = x$.

3. Given the roots of the quadratic equation $px^2 + 9x + 4 = 0$ is 4 and $\dfrac{1}{2}$. Find the value of p .

4. Given the quadratic equation $x^2 + px + 9 = 0$ has two equal roots. Find the value of p .

5. Given the difference between the two roots of the quadratic equation $2x^2 - 14x + p = 0$ is 3 . Find the value of p .

6. A root of the quadratic equation $x^2 + x + p = 0$ is 3. Find the value of the other root .

7. Without solving the quadratic equation, determine the nature of the roots for $4x^2 + 6x - 3 = 0$.

8. Express $2(x+1)^2 = 5x + 3$ in the general form of a quadratic equation .

9. Find the roots of the equation , $2x^2 + 5x = 12$.

10. Given that a root is twice the other root of the quadratic equation $4x^2 - 18x + p = 0$, find the value of p .

11. Find the roots of the quadratic equation $2x^2 = 5x + 8$. Give your answer correct to 3 decimal places.

12. Given the equation $x^2 - 3x + k = 0$ has the roots of α and β such that $\dfrac{\alpha}{\beta} = -2$. Find the value of k .

13. Given y = mx is the equation of tangent to the curve $y^2 = 5x - 9$. Find the possible values of m .

14. Given p + 2 is a root of the equation $x^2 - 5x = 6$. Find the value of p .

15. The quadratic equation $x^2 - 2x + 1 = k(-x - 2)$ has two real and equal roots. Find the possible values of k .

16. The quadratic equation $mx^2 - 3mx + 6 = 3x + 4$ has a root of $\frac{1}{m}$. Find the value of m .

17. If the quadratic equation $(k+1)x^2 - (k+1)x + 2 = 0$ has two real and equal roots, prove that k = 7 .

18. Solve the equation (5x – 3)(x + 1) = x (2x – 5) . Give your answer correct to four significant figures .

19. The quadratic equation $(p+5)x^2 = 8x - 1$ has two distinct roots . find the range of p .

20. Form the quadratic equation which has the roots of 2 and $\frac{1}{2}$. Give your answer in the form of $ax^2 + bx + c = 0$ where a, b and c are constants .

21. Given that m and n are the roots of (x – 2) (x + 1) + k = 0 and mn = - 6 . find the value of k, m and n .

22. Given the quadratic equation $4x^2 - 3kx + k + 5 = 0$. Find

    a. the value of k if the quadratic equation has two real and equal roots .
    b. the range of k if the quadratic equation has two real and distinct roots .

23. The quadratic equation $x^2 - 2kx + k + 1 = 0$ has the roots of m and n . Given that $m^2 + n^2 = 4$, find the value of k .

24. The quadratic equation $px^2 - 5qx + 9p = 0$ has two real and equal roots. Given that p and q are positive, find the ratio of p to q. hence, solve the equation .

25. The quadratic equation, $3x^2 - 2px + 9q = 0$ has the roots -5 and 2 . Find

a. the value of p and q

b. the range of k such that $3x^2 - 2px + 9q = k$ has no real roots.

Paper 2

1. a. Determine if $0, -1$ and 3 are the roots of the quadratic equations $8(x-1)^2 = 32$.

b. Given that 2 is one of the roots of quadratic equations $x^2 + 3x - p = 0$, where p is a constant . Find the values of the root.

2. a. Given the quadratic equations $mx^2 - 2nx + 3 = 0$ has two equal roots ,express n in terms of m.

b.

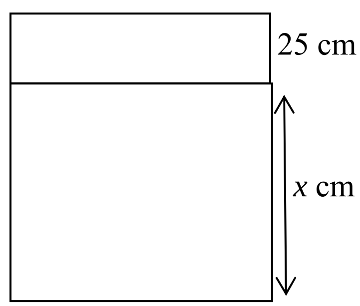


Diagram 2

The Diagram 2 above shows a window with two parts. The top part is a rectangle and the bottom part is a square. Given that the area of the window is $2000 cm^2$.

i. Show that $x^2 + 25x - 2000 = 0$,

ii. Find the value of x,

iii. Find the area of the rectangle.

3. a. Given that p and q are roots of the equation $4x^2 + x - 12 = 0$. Form a quadratic equation which has the roots $2p - 1$ and $2q - 1$.

b. The quadratic equation $x(x - 2m) = -(3m + 4)$ has equal roots. Find value of m.

4. a. Given that the roots of the quadratic equation $2x^2 + (3 - k)x + 8p = 0$ are p and 2p , $p \neq 0$. Find k and p.

b. Find the range of values of k if the quadratic equation $x^2 + 2kx + k + 6 = 0$ has equal roots.

5. a. The equation $x^2 - 6x + 7 = h(2x - 3)$ has roots which are equal. Find the values of h.

b. Given that α and β are roots of the equation $x^2 - 2x + k = 0$, while 2α and 2β are the roots of the equation $x^2 + mx + 9 = 0$. Determine the possible values of k and m.

6. a. Given $\frac{p}{2}$ and $\frac{q}{2}$ are roots of the equation $kx(x - 1) = m - 4x$. If $p + q = 4$ and $pq = -5$, find the values of k and m .

b. The quadratic equation $2x^2 + px + q = 0$ has roots -2 and 3. Find the value of p anf q so that $2x^2 + px + q = k$ has real roots.

7. a. Given ½ and -5 are roots of a quadratic Equation.Write down the quadratic equation in the form $ax^2 + bx + c = 0$.

b. Find the range of values of x for which the equation $x^2 + kx + 2k - 3 = 0$ has no real roots.

8. a. The quadratic equation $x^2 + mx + 4 = 3x$ has two equal roots. Find the possible values of *m*.

b. Form the quadratic equation which has the roots -3 and $\frac{1}{2}$. Give your answer in the form $ax^2 + bx + c = 0$, where *a*, *b* and *c* are constants.

c. Solve the quadratic equation $2x(x-4) = (1-x)(x+2)$. Give your answer correct to four significant figures.

9. a. A quadratic equation $x^2 + 3x = kx + 4$ has distinct roots. Find the possible values of k

b. The roots of the quadratic equation $2x^2 - 5x + 4 + k = 0$ are h and 3 find the value of k and h

10. a. Find the range of the values of p if the quadratic equation $px^2 + 6x - 2 = 0$ has no roots .

b. Solve the quadratic equation $2x(x-4)=(1-x)(x+2)$. Give your answer to four significant figures.

QUADRATIC FUNCTIONS

Paper 1

1. Find the range of x that satisfies the quadratic inequality of $3x - 4 > -x^2$.

2. Given 4x – 2y + 3 = 0 . Find the range of x if y . 2 .

3. Find the range of x if 8x $\leq$ $3x^2$.

4. Given the graph $y = p - 2(q - x)^2$ has a minimum point of (3, -4) . find the value of p and q .

5. Skecth the graph of $f(x) = (x - 3)^2 - 6$ for the domain $0 \leq x \leq 6$.

6. Find the range of x if (2x + 1)(x – 3) < 0 .

7. Find the range of k such that $2x^2 - 5x + k$ is always positive .

8. Find the range of x for 3y + 1 = 4x and 2y > 1 + x .

9. Find the value of m such that the equation $(1 + m)x^2 - 3mx + 3 = 0$ has equal roots .

10. Find the equation of the axis of symmetry for the graph of $y = 2x^2 + 5x + 3$.

11. Find the range of x given 3 – 2x < 13 and 3x – 2< 4 .

12. Find the range of m if y = mx +1 does not intersect with the curve of $y = x^2 - 3x + 5$.

13. Find the range of x if $3x^2$ $\geq$ 75 .

14. State the coordinates of the minimum point of $y = 2(5x - 3)^2 - 4$.

15. Given y = 2x + 3 intersects with the curve of $y = 3x^2 + mx + 6$ at two different points. Find the range of m .

16. Find the range of x, if x (6x - 7) > 10 .

17. Find the value of p , if the graph of $y = x^2 + px + 5$ is a tangent to line y = 4 .

18. Determine the equation of the curve $y = 5 - (x-3)^2$ after it is reflected at the x-axis.

19. Find the range of p if y = 2x + p does not intersect at the curve of $x^2 + y^2 = 5$.

20. Find the range of x, if $\frac{2x}{2x+1} > 0$.

21. Find the range of x, if (x – 3)(x + 5) > (x – 3)(3x – 2) .

22. Given $x = \frac{8-y}{3}$. Find the range of x if y > 10 .

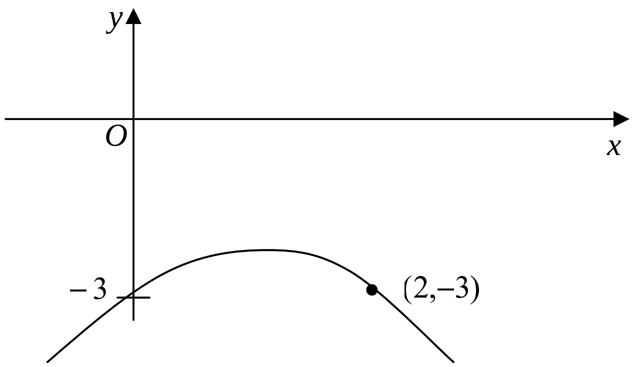
23. Given $f(x) = 2x^2 - x + 5 = a(x+b)^2 + c$.
   a. find the value of a, b and c .
   b. sketch the graph of $f(x) = 2x^2 - x + 5$.

24. Given the coordinates of the minimum point of $f(x) = 2x^2 - px + q$ is (2, 5) . Find the values of p and q .

25. Given the graph $y = p - (3x+q)^2$ has a maximum point at $\left(\frac{2}{3}, 6\right)$.
   a. find the value of p and q .
   b. sketch the graph .

Paper 2

1. a. Diagram below shows the graph of a quadratic function $y = -(x-k)^2 - 2$, where k is a constant.



Find

i. the value of k,

ii. the equation of the axis of symmetry,

iii. the coordinates of the maximum point.

b. Solve the inequality $2x^2 + 3x - 2 \geq 0$

2. a. Given $f(x) = x^2 + (1-m)x - m$. The curve $y = kf(x)$ cut the y-axis at the point $(0,15)$. If $m = 3$ find value of k.

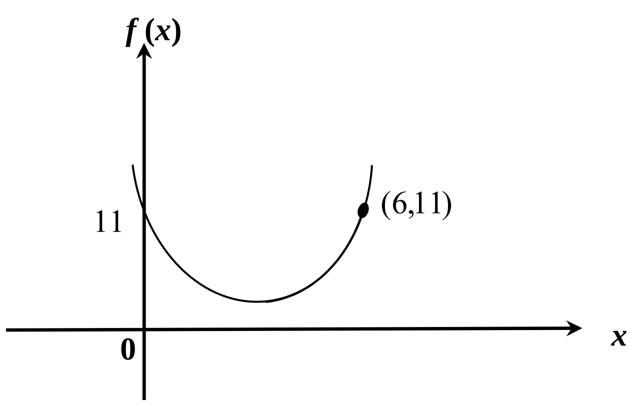


Diagram 6

b. The Diagram 5 above shows the graph of a quadratic function $f(x)=(x-h)^2+2$,where h is a constant.
Find
i. the value of h,
ii. the equation of the axis of symmetry,
iii. the coordinates of the minimum point.

3. a. Diagram 1 shows the graph of a quadratic function $f(x)=px^2+4x-q$, where p and q are constants.

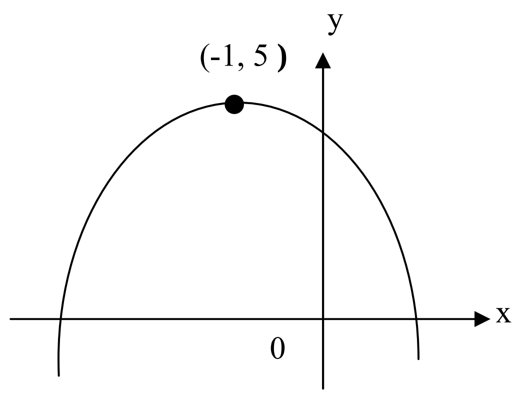


Diagram 7

The curve $y=f(x)$ has a maximum point (-1, 5). State

i. the value of p
ii. the value of q

b. Given that the quadratic functions $f(x)+3=8x-3-4x^2$. Express $f(x)$ in form $p+q(x+r)^2$ where p,q and r are constants.

4. a.

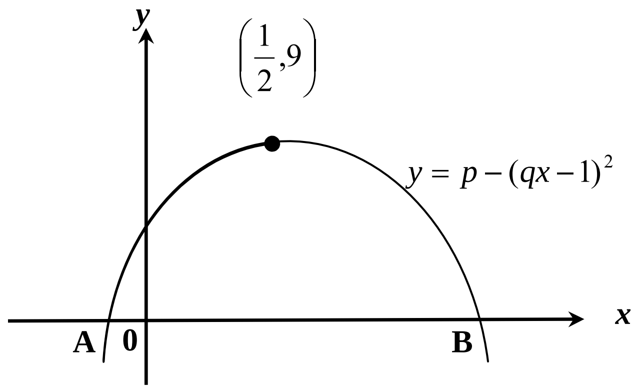


Diagram 3

In the above Diagram 3, the point $\left(\frac{1}{2},\ 9\right)$ is the maximum point of the curve $y = p - (qx - 1)^2$ where p and q are constants.

Find

i. the value of p and q,

ii. the coordinates of the points A and B.

b. The graph of the function $f(x) = 2x^2 + (3 - k)x + 8$ does not touch the x-axis. Determine the range of k.

5. a. Find the range of x if $3x(2x + 3) \geq 4x + 1$

b. Solve $5 + m^2 > 9 - 3m$.

c. A quadratic functions f is defined by $f(x) = x^2 - 4x - 5$. Sketch the graph of function $f(x)$.

6. a. Given $f(x) = x^2 + (1 - m)x - m$. The curve $y = kf(x)$ cut the y-axis at the point $(0,15)$. If $m = 3$ find value of k.

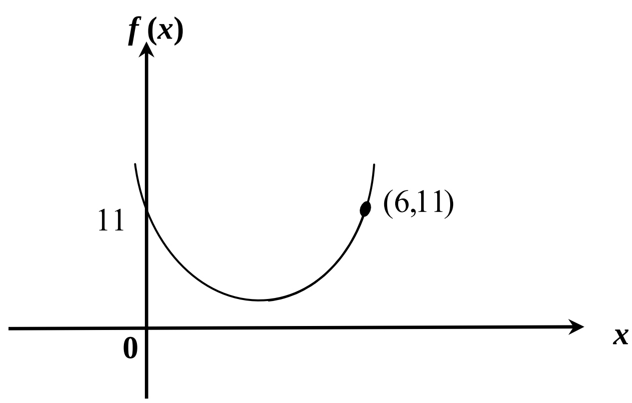


Diagram 5

b. The Diagram 5 above shows the graph of a quadratic function

$f(x) = (x-h)^2 + 2$,where h is a constant.
Find
i. the value of h,
ii. the equation of the axis of symmetry,
iii. the coordinates of the minimum point.

7. a. Given $f(x) = 2x^2 - 8$. Find the range of x so that f(x) is positive.
   b. Find the range of x which satisfy the inequality $(x-1)^2 > x - 1$

8. a. The graph of the function $y = 2x^2 + 2px + 5p - 12$ cut the x-axis twice.Find the range of the values of p.
   b. Find the range of values of x for $(x-1)^2 > (2x+3)(x-1)$

9. a. Given $y = h + 4kx - 2x^2 = q - 2(x+p)^2$ .Find p and q in terms of h and / or k.
   b. If h = -10 and k = 3,
      i. State the equation of the axis of symmetry,
      ii. Sketch the graph of y = f(x)

10. Diagram 2 shows the graph of a quadratic function $f(x) = 3(x + p)^2 + 2$, where p is a constant. The curve $y = f(x)$ has the minimum point $(4, q)$, where q is a constant.
State
a. the value of p,
b. the value of q,
c. the equation of the axis of symmetry.

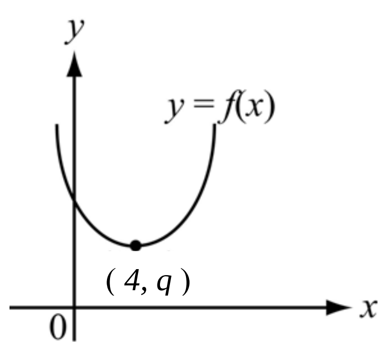


Diagram 8

SIMULTANEOUS EQUATIONS

Paper 2

1. Solve the simultenous equations, y = 4 – 2x and $y^2 - 4x = 0$.

2. Solve the simultenous equations, y = 2 – x and $2x^2 + y^2 - 8 = 0$.

3. Solve the simultaneous equations, y = 5 – x and $x^2 + y^2 = 1 + 2xy$

4. Solve the simultaneous equations, x + 3y = 1 and $x^2 + 3x + 5y = 20$

5. Solve the simultaneous equations, x + y = 1 and $6x^2 - y^2 = 2$

6. Solve the simultaneous equations, x = 3 + y and $x^2 - xy + 2y^2 = 14$

7. Solve the simultaneous equations, x = 2 – 2y and $2y^2 - xy - 6 = 0$

8. Solve the simultaneous equations, 2x + y = 8 and $4x^2 + 3y^2 = 52$

9. Solve the simultaneous equations, x + 2y = 0 and $x^2 + y^2 + 8x + 10y - 8 = 0$

10. Solve the simultaneous equations, y – 4x = 3 and $x^2 - y + 2xy = 8$

11. Solve the simultaneous equations, x - 7y = 2 and $x^2 + -34y^2 = 7xy - 16$

12. Solve the simultaneous equations, x + 2y = 5 and $5x^2 + 4y^2 + 12x = 29$

13. Solve the simultaneous equations, 5x - 2y = 6 and $2xy - 6x^2 = 5$.

14. Solve the simultaneous equations, 3x – 2y = 5 and $y(x + y) + 5 = x(x + y)$.

15. Solve the simultaneous equations, $4x + y + 8 = x^2 + x - y = 2$

16. Solve the simultaneous equations, $2(x - y) = x + y - 1 = 2x^2 - 11y^2$

17. Solve the simultaneous equations, 2y = x – 2 and $\frac{x}{y} + \frac{6y}{x} = 5$

18. Solve the simultaneous equations, $\frac{x}{2}+\frac{y}{4}=1$ and $(x+1)y=5x+2$

19. The straight line x – y = 5 intersects the curve $x^2+2xy+y^2=9$ at point P and point Q . Find the coordinates of P and Q .

20. Given point (-1 , 2p) is the solution of the simultaneous equation $x^2+ky-29=4=kx-xy$, where k and p are constants. Find the value of k and p .

21. Given the perimeter and the area of a rectangular field are 80 m and 396 m^2 respectively . Find the length and the breadth of the field.

22. Given the straight line 2x - 3y =4 intersects with the curve $x^2-xy+y^2=k$ at point (-4, h). Calculate
    a. the value of h and k .
    b. the other intersection point .

23. Solve the simultaneous equations,
x - 4y = 8 and $y^2+8y-x=4$.

24. Solve the simultaneous equations 3p + q = 5 and $p^2-2q=-5$. Give your answer correct to three decimal places .

25. Solve the simultaneous equations,
3x + y = 3 and $\frac{2}{3x}+\frac{1}{y}=2$

INDICES AND LOGARITHMS

Paper 1

1. Solve $3^{x^2} - 9^{6-2x} = 0$.

2. Express $5^{2n+1} - 5^{2n} - 15(5^{2n-1})$ to its simplest form.

3. Solve $4^{\log_5 x} = 64$.

4. Solve $3^{x-2} - 5^x = 0$.

5. Solve $3(9^{x+4}) = 27^{x+1}$.

6. Evaluate the expression $\dfrac{3^{n+3} - 3^{n-1}}{4(3^{n-2})}$.

7. Given $3 - \log_3 x = 2\log_3 y$. Express x in terms of y.

8. Given $\log_m 2 = x$ and $\log_m 5 = y$. Express $\log_m 12.5m$ in terms of x and y.

9. Solve $\log_2 x + \log_4 2x = 3\frac{1}{2}$.

10. Find the value of y given $\log_{\sqrt{y}} 5 - \log_{\sqrt{y}} 135 = 3$.

11. Solve $\log_9 \left[\log_3(2x+1)\right] = \log_{16} 4$.

12. Find the value of m, if $\log_m 27 = 9$.

13. Evaluate $\log_3 3\sqrt{3}$.

14. Solve $125^{x-1} = \dfrac{25}{\sqrt{5^{x+3}}}$.

15. Solve $\log_3 p = \log_3(p+4) + 1 - \log_3(p-1)$.

16. Given $\log_2 k + \log_4 w = \frac{5}{2}$. Express k in terms of w.

17. Given $\log_3 5 = m$ and $\log_3 7 = n$. Find the value of p if $\log_3 p = \frac{3m-n}{2}$.

18. Given $\log_2 x = m$ and $\log_4 y = n$. Express each of the following in terms of m and n .
a. $x^2 y$
b. $\frac{x}{y^2}$

19. Given $\log_{\sqrt{x}} 9 = m$ and $\log_{\sqrt{y}} 27 = n$. Express $\log_{27} xy$ in terms of m and n .

20. Solve $3^y \times 9^{y+1} = 27^{1-2y}$.

21. Solve $\log_{10}(2x+1) = \log_{10} x + \log_{10}(2x+3)$.

22. Solve $4^{\log_3 x} = 8$.

23. Given $\log_2 3 = 1.582$ and $\log_2 5 = 2.322$. Without calculator , find the value of .
a. $\log_2 60$
b. $\log_{15} 8$

24. Given $2^{2x}(8^y) = 2$ and $9^x(3^y) = 27$. Find the value of x and y .

25. Given the curve $y = ax^n - 6$ passes through (5, 1.5) and (25, 31.5) . Find the value of a and n .

Paper 2

1. a.` Solve the equation $81^{x+1} - 27^{2x-3} = 0$.
   b. Given $\log_7 2 = h$ and $\log_7 5 = k$. Express $\log_7 2.8$ in terms of h and k.

2. a. Given that $\log_7 2$ = m and $\log_7 5$ = 5 – n . Express $\log_7 2.8$ in terms of m and n..
   b. Solve the equation $\log_5(8x-4) = 2\log_5 3 + \log_5 4$.
   c. Solve the equation $\log_3(3t+9) - \log_3 2t = 1$.

3. a. Solve the equation $2^{2x+4} = \dfrac{2}{16^x}$.
   b. Solve the equation $8^{4x} = 4^{x-2}$
   c. Solve the equation $\log_2 6x - \log_2(x+3) = 2$

4. a. Solve the equation $6^{x+3} - 6^{2x-1} = 0$
   b. Given that $\log_a 2 = m$ and $\log_a 7 = n$, express $\log_a 3.5a$ in terms of m and n.
   c. Solve the equation $\log_3(5x-4) = 2 - \log_3 x$

5. a. Solve the equation $\dfrac{1}{25^x} = 125 \times 5^x$
   b. Given $\log_{32} n = \dfrac{1}{5}$, find the value of n
   c. Solve the equation $\log_2 x^2 - \log_2(x-3) = 4$

6. a. Solve the equation $\log_3 x - \log_3(x-3) = 1$
   b. Solve the equation $8^{2x-3} = \dfrac{1}{\sqrt{4^{x+2}}}$
   c. Solve the equation $\log_3 x = 2 + \log_3(x-1)$

7. a. Given that $\log_{16} y - \log_4 x = 1$,express y in term of x.
   b. Given that $\log_{10} 2 = 0.3010$ and $\log_{10} 7 = 0.8451$. Find the value of $\log_{10} 28$.
   c. Solve the equation $\log_2 x - \log_4 x = -2$.

8. a. Without using calculator ,evaluate $2\log_5 10 + 3\log_5 2 - \log_5 32$,

b. If $\log_2 7 = a$ express $2\log_8 7 - \frac{1}{2}\log_{16} 49$ in terms of a.

c. Solve $2\log_2(2x+1) = \log_2(x+5) + \log_2(4x-3)$.

9. a. Solve the equation $125^{x+2} = \dfrac{1}{\sqrt{25^{2x+4}}}$

b. Given that $3\log_4 xy = 1 + 2\log_4 y + \log_4 x$, express y in terms of x.

c. Solve the equation $\log_2(4x+1) = 3 + \log_2 x$.

10. a. Solve the equation $5^{2x-1} - 120 = 5$.

b. Find the value of x of $2\log_3 x - \log_9 x = 2$.

c. Solve the equations $27(9^x) = 1$.

PROGRESSIONS

Paper 1

1. Find the 16th term of the arithmetic progression

   $\frac{1}{3}, 1\frac{2}{3}, 3, \ldots\ldots.$

2. Find the number of the multiples of 3 between 20 and 110 .

3. For the arithmetic progression 5, 8, 11,.... Which terms is equal to 320 .

4. Given that 4k, 12, $2k^2 + 4k$ are three consecutive terms of an arithmetic progression, find the possible values of k .

5. The 12th term and the 17th term of an arithmetic progression are 38 and 53 respectively. Find the common difference.

6. Find the sum of the first n terms of the arithmetic progression

   11, 7, 3, ...

7. How many terms of the arithmetic progression 12, 16, 20.....must be taken for the sum to be equal to 132 .

8. The second term of an arithmetic progression is 8 while the sum of the first six terms is 30. Find the common difference .

9. The sum of the first 6 terms of an arithmetic progression is 72 while the sum of the first 9 terms is 81. Find the common difference .

10. If the sum of the first n terms of an arithmetic progression is given by $S_n = n(2n+3)$, find the common difference .

11. Calculate how many months it will take to repay a debt of RM5800 by monthly payments of RM100 initially with an increase of RM20 for each month after that.

12. Find the sum of first 6 terms of the geometric progression $3, 2, \frac{4}{3}, \ldots\ldots\ldots$

13. Find the 8th term of the geometric progression 3, -6, 12, -24,.....

14. For the geometric progression 3, 6, 12,.......calculate the least number of terms that must be taken for the sum to exceed 1000.

15. If the second term of a geometric progression is 3 and the seventh term is $\frac{32}{81}$, find the first term.

16. The third term and the sixth term of a geometric progression are 27 and 8 respectively . Find the second term .

17. The second term and the third term od a geometric progression are $\frac{1}{2}$ and 1 respectively . Find the sum of the first three terms .

18. Given that x + 2, 2x , 2x + 3 are the first three terms of an arithmetic progression, find
    a. the value of x .
    b. the sum of the next 20 terms.

19. In a certain arithmetic progression, the sum of the first n terms is given by $S_n = 6n^2 + 3n$. Find
    a. the n th term of n .
    b. the common difference.

20. The first term of an arithmetic progression is 24 . It consists of 23 terms. Given that the sum of the last 3 terms is 5 times the sum of the first 3 terms, find
    a. the common difference
    b. the sum of the first 11 terms .

21. If the sum to infinity of a geometric progression is 64 and the first term is 16, find the common ratio.

22. Write the recurring decimal 0.459459459........as a single fraction in its lowest terms.

23. A geometric progression is such that the second term is 6 and the sum to infinity is 32 . Find the possible values of the common ratio.

24. Given that the first term of a geometric progression is 18 and the sum of the first three terms is 38, find the possible values of the common ratio.

25. The sum of the first 6 terms of an arithmetic progression is 39 and the sum of the next 6 terms is – 69. Find
a. the first term and the common difference.
b. the sum of all the terms from the 15^{th} term to the 25^{th} term .

Paper 2

1. The mass of chemicals produced by a factory increases by 8 % every year. 6 000 tonnes of chemical were produced in 1993 .
a. Calculate the mass of chemicals produced by the factory in 1999.
b. Determine in which yea did the total mass of chemicals produced exceeds 85000 tonnes for the first time.

2. Diagram 2 shows a part of a series of squares with ABCD as the first square with sides 24 cm, AEFG the second square, AHIJ the third square and so on . Each square is drawn in such a way that the length of each side is half that of the previous square.

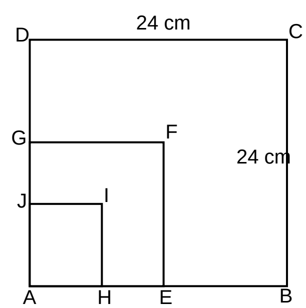


Diagram 2

a. Find the area of the fifth square in the series .
b. Estimate the total area of all the squares that can be drawn in this manner.
c. Find which square tat has its length of sides less than 0.05 cm for the forst time.

3.

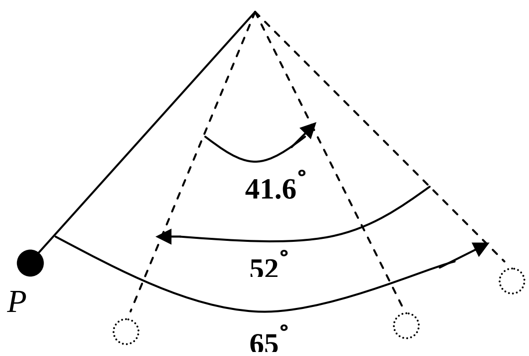


Diagram 3

a. The above diagram shows a pendulum released from the position *OP*. It swings freely through the angle of 65°, 52°, 41.6° and so on. Calculate the total angle it covers in 8 swings.

b. The sequence -11, -5, 1,......is an arithmetic progression. State the three consecutive terms of this arithmetic progression where the sum of these three terms is 93.

4. Diagram 4 shows an arrangement of these right-angled triangles for the infinite series of similar triangles.

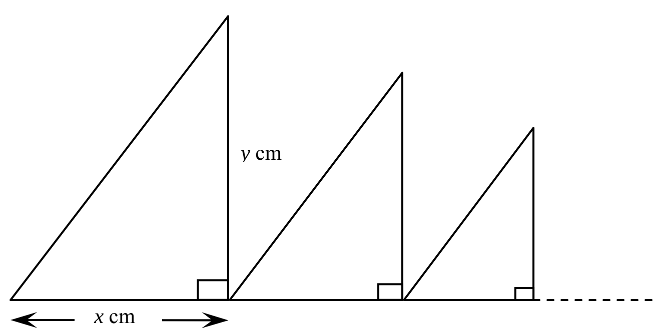


Diagram 4

The base and the height of the first right-angled triangle is x cm and y cm respectively. The base and the height of the subsequent triangle are a quarter of the base and half of the height of the previous triangle.

a. Show that the areas of the triangles form a geometric progression. State the common ratio of the progression.

b. Given x = 160 cm and y = 320.

i. Determine which triangle has an area of $6\frac{1}{4}$ cm^2.

ii. Find the sum to infinity for the area, in cm^2, of all the triangles.

5. Diagram 1 shows the first four semi-circles of the 16 semi-circles formed from a piece of wire. The radius of the first semi-circle is p cm and the radius of the subsequent semi-circles decrease uniformly by 3 cm. Given the radius of the smallest semi-circle is 5 cm.

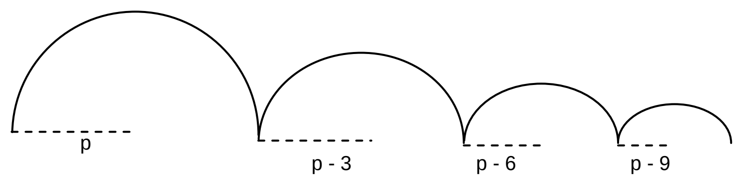


Diagram 1

Calculate

a. the value of p.

b. the length of the wire (in terms of π) needed to form the above 16 semi-circles.

6. a. An arithmetic progression consists of 10 terms. The sum of the last 5 terms is 5 and the fourth term is 9 . Find the sum of this progression.

b. The price of a house in a certain residential area is RM200 000. Its price increases by 6 % each year. Find the minimum number of years needed for the price to exceed RM500 000 for the first time.

7. Ramesh has 189 new stamps. He puts 3 stamps in the first album, 6 stamps in the second album, 12 stamps in the third album and so on .

a. Show that the number of new stamps in each album forms a geometric progression.

b. How many albums are used.

8. The sum of the fourth and the fifth terms of a geometric progression is 12 . If the fourth term of the progression is 8, find
   a. the common ratio and the first term of the progression.
   b. the sum to infinity of the progression.

9. If $\log_{10} p$, $\log_{10} pq$ and $\log_{10} pq^2$ are the first three terms of a progression.
   a. Show that it forms an arithmetic progression.
   b. Find the sum of the first 5 terms of the progression.

10. In the beginning of year 2005, Azmi inversted a sum of RM 1500 in a cooperative fund that gives an annual interest of 6.0 %. At the end of each year Azmi reinvests both the principal sum and its interest in the fund.
    a. Calculate the sum invested at the end of the third year.
    b. At the end of which year will the total investment first exceed RM3000.

LINEAR LAW

Paper 1

1. Reduce the non-linear equation $y = qx^{-2p}$ to the linear form, where p and q are constants.

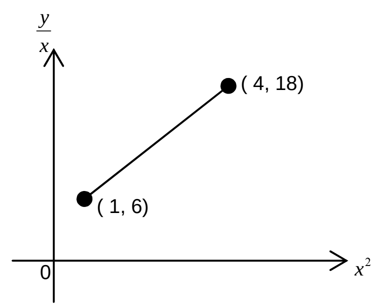
2. If the equation $y = p(10^{qx})$, where p and q are constants, is reduced to the linear form, find
   a. the gradient .
   b. the Y-intercept, in terms of p and or q .

3. If a straight-line graph of y against $\frac{y}{x}$ is drawn to represent the equation hx + ky = xy, where h and k are constants, find
   a. the gradient.
   b. the Y-intercept, of the straight line in terms of h and/ or k .

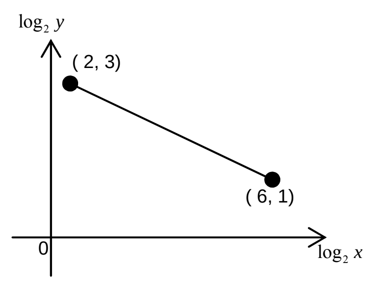
4. Explain how a straight line graph can be drawn to represent the equation $y = a(3)^{-\frac{b}{x}}$, where a and b are constants.

5. If a straight line graph of $\frac{1}{y}$ against x is drawn to represent the equation $y = \frac{c}{d - x}$, where c and d are constants, find
   a. the gradient
   b. the Y-intercept, of the straight line in terms of c and/ or d .

6. The below figure shows part of a straight-line graph drawn to represent the equation $y = hx^3 + kx$, where h and k are constants. Find the value of h and of k.



7. The below figure shows part of a straight line graph drawn to represent the equation $y = mx^n$, where m and n are constants. Find the value of m and of n .

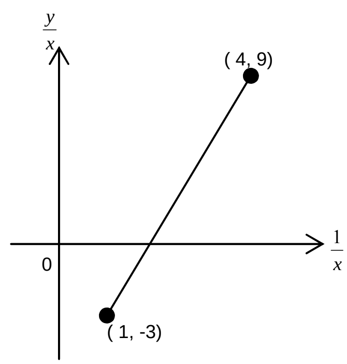


8. When the graph of $\log_{10} y$ is plotted against $\log_{10} x$ to represent the equation $y = \frac{\sqrt{x}}{k}$, where k is a constant, a straight line that passes through the point (4, 1) is obtained . Find the value of k .

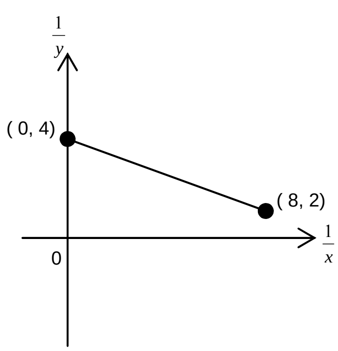
9. When the graph of $\log_2 y$ is plotted against $\log_2 (x-2)$ to represent the equation $y = k(x-2)^n$, where k and n are constants, a traight line that passes through the point (-1, 2) and (2, -1) is obtained. Find the value of k and of n .

10. When the graph of $\log_3 y$ is plotted against $\log_3 x$ to represent the equation $y = \frac{x^{3m}}{k}$, where m and k are constants, a straight line with a gradient of 3 and passes through the point (2, 3) is obtained . Find the value of m and of k .

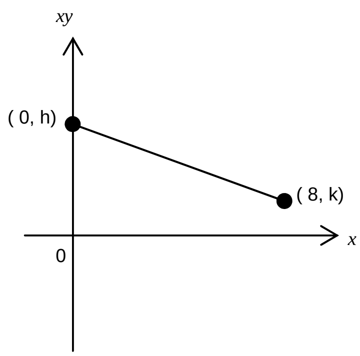
11. The variable x and y are related in such a way that when $\frac{y}{x}$ is plotted against $\frac{1}{x}$, a straight line that passes through the points (1, -3) and (4, 9) is obtained, as shown in the below figure . Express y in terms of x .



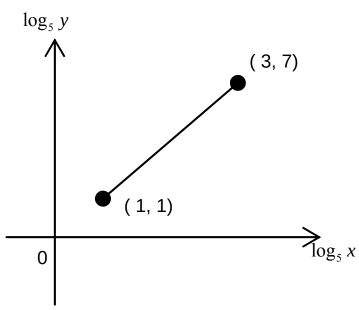
12. The variables x and y are related in such a way that when $\frac{1}{y}$ is plotted against $\frac{1}{x}$, a straight line that passes through the points (0, 4) and (8, 2) is obtained, as shown in the figure . Express y in terms of x .



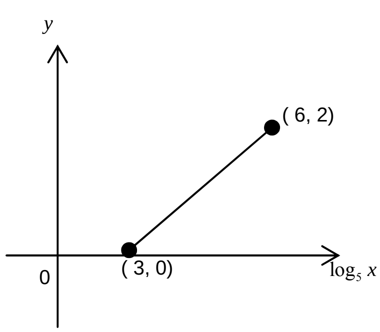
13. The below figure shows part of a straight line graph drawn to represent the equation $y = \frac{6}{x} - \frac{1}{2}$. Find the value of h and of k .



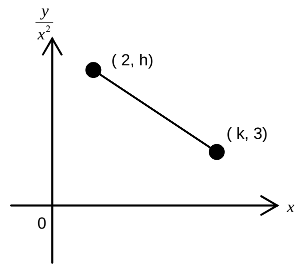
14. The below figure shows the graph of $\log_5 y$ against $\log_5 x$. The values of x and y are related by the equation $y = ax^n$, where a and n are constants . Find the value of a and of n .



15. The variables x and y are related in such a way that when y is plotted against $\log_{10} x$, a straight line that passes through the points (3, 0) and (6, 2) is obtained, as shown in the above figure . Calculate the value of y when x = 1000.

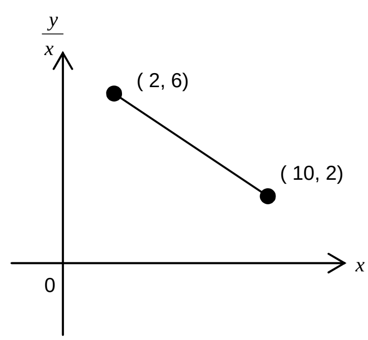


16. The following diagram shows the straight line graph of $\frac{y}{x^2}$ against x .



Given that $y = 7x^2 - x^3$, calculate the value of h and of k .

17. x and y are related by the equation $y = px^2 + qx$, where p and q are constants. A straight line is obtained by plotting $\frac{y}{x}$ against x , as shown in the diagram below .



Calculate the value of p and of q .

18. Diagram 2 shows the graph of $\frac{1}{y}$ against $\frac{1}{x}$.

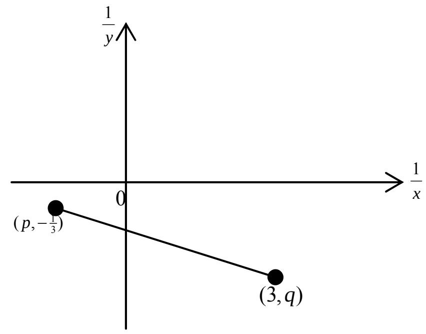
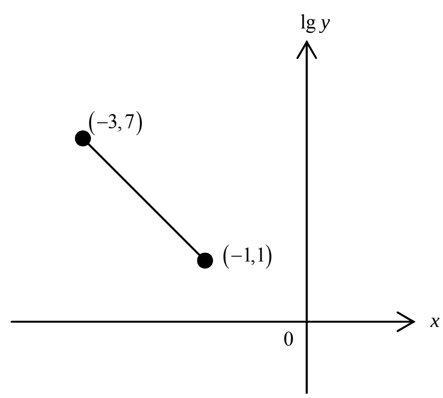


Diagram 2

Given that $y = -\dfrac{3x}{1+6x}$, find the values of p and q .

19. The experimental values of x and y are related by the equation $\dfrac{y^2}{2a} = 1 - \dfrac{x^2}{3b}$. When y^2 is plotted against x^2, a straight line is obtained with a gradient of - 2.5 and a y^2-intercept of 5 . Calculate the values of a and b.

20.



The diagram above shows part of a straight line obtained by plotting $\log_{10} y$ against x . If the straight line passes through $(-3, 7)$ and $(-1, 1)$, express y in terms of x

Paper 2

1. Table shows the values of two variables, x and y, obtained from an experiment. Variable x and y are related by the equation $y = pk^{1-x}$ where p and k are constants.

x	0.30	0.40	0.50	0.60	0.70	0.80	0.90
y	2.24	2.64	3.04	3.50	4.03	4.64	5.34

Table 1

a. Plot $\log y$ against $(1-x)$, using a scale of 2 cm to 0.1 unit on the $(1-x)$ – axis and 2 cm to 0.05 unit on the $\log y$ – axis. Hence, draw the line of best fit.

b. Use your graph from (a) to find the value of

i. p

ii. k

2. Table 1 below shows the value of two variables, x and y, obtained from an experiment. Variables x and y are related by the equation $y = mn^{x+1}$, where m and n are constants.

x	1	2	3	4	5	6
y	4.0	5.7	8.7	13.2	20.0	28.8

Table 2

a. Complete the table below and plot $\log_{10} y$ against $(x + 1)$. Hence, draw the line of best fit.

x + 1	2		4	5		
y	0.60	0.76				

Table 3

b. Use your graph, to find the value of

i. m

ii. n

3. The variables a and y are known to be related by the equation $y^2 = ax + bx^2$, where a and b are constants. Table 1 shows the corresponding values of x and y obtained from an experiment.

x	2	4	6	8	10
y	2.82	4.91	7.01	9.02	11.2

Table 4

a. By using a scale of 2cm to represent 1 unit on both axes, plot $\frac{y^2}{x}$ *against* x. Hence , draw the line of best fit.

b. Use the graph in (a) to find,
i. the values of a and b
ii. the values of x satisfying $(a-b)x + bx^2 = 0$

4. Use graph paper to answer this question.

x	20	10	6.25	4.55	3.23
y	1.19	1.45	2.22	2.94	16.7

Table 5

Table 2 above shows the data of an experiment for two variables x and y, which are related by a law in an equation $\frac{x}{y} = p + qx$, where p and q are constants. One of the data has been recorded wrongly.

a. From the graph, find
i. the value of y which is recorded wrongly and the value it supposed to be,
ii. the values of p and q,
iii. the value of x when y = 12.

b. A linear graph can also be produced if Y versus X is plotted where X and Y are
function for x and/or y respectively. State X and Y in terms of x.

5. Use a graph paper to answer this question.

Table 1 shows the values of two variables, x and y, obtained from an experiment. The variables x and y are related by the equation $y = hk^{\frac{x}{2}}$, where h and k are constants.

x	1	2	3	4	5	6
y	6.31	10.01	15.49	25.12	39.81	63.10

Table 7

a. Plot $\log_{10} y$ against x, by using a scale of 2 cm to 1 unit on x-axis and 2 cm to 0.2 unit on y-axis.Hence, draw the line of best fit.

b. Use the graph from (a) to find the value of

i. h

ii. k

6. *Use the graph paper provided to answers this questions*
The following corresponding variables of x and y were measured

x	2	3	4	5	6	7
y	2	4.5	5.6	6.3	6.8	7.1

Table 8

The variables x and y are related by the equation $xy = ax + b$, where a and b are constants

a. Plot xy against x, by using a scale of 2cm to 1 units on the x-axis and 2cm to 5 units on the y-axis. Hence, draw the line of best fit

b. Use the graph from (a) to find the value of
   i. a
   ii. b

7. *Use the graph paper to answer this question.*
Table below shows the values of two variables, x and y, obtained from an experiment. Variables x and y, are related by the equation $y = pk^x$, where p and k

x	2	4	6	8	10	12
y	3.16	5.50	9.12	16.22	28.84	46.77

Table 9

a. Plot $\log_{10} y$ against x by using a scale of 2 cm to 2 units on the x-axis and 2 cm to 0.2 unit on the $\log_{10} y - axis$ .Hence, draw the line of best fit

b. Use your graph from (a) to find the value of
   i. p
   ii. k

8. The table shows the experimental values of two variables, x and y . It is known that x and y are related by an equation in the form $y = \frac{9}{p^2}(x-m)^2$, where p and m are constants.

x	1.0	1.5	2.0	2.5	3.0	3.5
y	0.81	2.72	5.76	9.92	15.21	21.62

a. Draw the graph of $\sqrt{y}$ against x, using a scale of 2 cm to 0.5 units on both the x – axis and the y – axis.

b. From your graph, find
  i. the value of p .
  ii. the value of m
  iii. the value of y when x = 1.9 .

9. The table below shows the values of two variables, x and y, obtained from an experiment. It is known that x and y are related by the equation $y = ab^x$, where a and b are constants .

x	1	2	3	4	5
y	1.32	1.76	2.83	5.51	13.00

a. Plot $\log_{10} y$ against x^2, using a scale of 2 cm to 5 units on the x- axis and 2 cm to 0.1 unit on the y-axis. Hence, draw the line of best fit .

b. Use the graph in (a) to find the value of .
  i. a
  ii. b

10. The table below shows the values of two viarables, x and y, obtained from an experiment . The variables x and y are related by the equation $y = pk^x$, where p and k are constants.

x	2	4	6	8	10	12
y	5.18	11.64	26.20	58.95	132.63	298.42

a. Plot $\log_{10} y$ against x by using a scale of 2 cm to 2 units on the x-axis and 2 cm to 0.2 units on the y – axis . Hence, draw the line of the best fit.

b. Use your graph from (a) to find the value of
  i. p
  ii. k

MODUL TOPIKAL

Index Numbers

1. Table 1 shows the prices and the price indices of three types of materials, *X*, *Y* and *Z*, which are the main ingredients in the production of an item in 2002 and 2005.

Price / Item	Price in 2002 (RM)	Price in 2005 (RM)	Weightage	Price indec in 2005 based on 2002
X	1.10	1.35	5	*a*
Y	0.50	*b*	2	120
Z	*c*	2.00	3	130

Table 1

Find,

a. the values of a, b and c,

b. the composite index of the cost of production of the item in 2005 based on 2002,

c. the unit price of the item in 2005 if the unit price of the item in 2002 is RM3.60.

2. The table shows the number of teachers, male students and female students in a school in the years 2004 and 2005.

	Year 2004	*Year 2005*	*Weightage*
Number of teachers	**120**	**126**	**5**
Number of male students	**1380**	**1587**	**7**
Nmber of female students	**180**	**189**	**1**

a. Using 2004 as the base year, calculate the index number in the year 2005 for teachers, male students and female students respectively.

b. Using the last column of the table as weightage, calculate the composite index number in the year 2005, with 2004 as the base year.

c. If the numberof male students increases at the same rate from year to year, calculate the number of male students in 2003 and 2006,

d. Calculate the index number for male students in 2006 based on the year 2003.

3.

Items	Price index	Weightage
Shirt	*n*	*3*
Trousers	*105*	*6*
Bag	*140*	*1*
Shoes	*135*	*2*

The table shows the price indices and the respective weightage of four items in the year 2005 based on the year 2003 as the base year. The composite index number of these items in 2005 is 120.

a. Calculate the value of *n*.

b. Find the price of a pair of shoes in the year 1994, given that its corresponding price in 1990 is RM 30.

c. If a person bought 3 shirts, 6 pairs of trousers, one bag and 2 pairs of shoes in 2005 for a sum of RM 2 160, find the amount he had to fork out for these items in the year 2003.

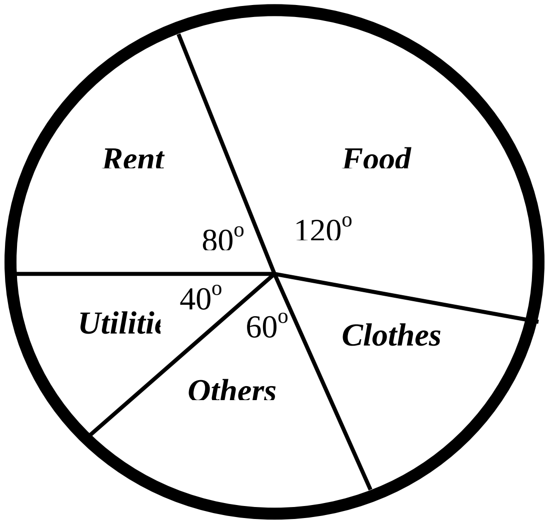
4. a. The price and price index in the year 1995 (year 1990 = 100) of a kg of a certain grade of rice are RM2.80 and 140 respectively. Calculate the price of a kg of such rice in 1990.

b.

Materials	***Price index in 1994***	***Change in price index from 1994 to 1996***	***Weightage***
Timber	160	+ 10	5
Cement	115	+ 10	4
Roof tiles	130	no change (± 0)	2
Steel	140	no change (± 0)	1

The given table shows the price indices of some construction matetials in the year 1994 using 1992 as the base year. The table also shows the change in the price indices for these materials from the year 1994 to the year 1996, with the respective weightage given in the last column. Calculate the composite index number of these construction materials in the year 1996, using 1992 as the base year.

5.



The above pie-chart shows the apportionment of the monthly expenses of Rizal's family in year 1990, indicating the respective weightage of the various categories of expenses incurred.

Categories of expense	*Index number*
Food	120
Rent	112
Utilities	110
Clothes	130
Others	125

The table shows the index number of each category of expenses by Rizal's family in the year 1993, based on the year 1990. Calculate

a. the composite index number of the monthly expenses of Rizal's family in the year 1993, giving your answer to the nearest integer,

b. the total monthly expenses, corret to the nearest ringgit Malaysia, in the year 1993, given that the total monthly expenses in the year 1990 is RM 900.

Linear Programming

1. A factory two types of LCD televisions, Super and Deluxe. The table below shows the time (in minutes) to assemble and test the televisions.

Time / TV	Assembling	Testing
Super	30	12
Deluxe	40	2

The factory produces *x* units of Super and *y* units of Deluxe a day. The assembling and testing of the televisions are based on the following constraints:

I : The maximum number of televisions produced in a day is not more than 40.
II : The total time for assembling the televisions is at least 20 hours.
III : The minimum total time for testing the televisions is 2 hours.

a. State the three inequalities other than $x \geq 0$ and $y \geq 0$ that satisfy the constraints above.

b. Using a scale of 2 cm to 5 units on both the *x*-axis and *y*-axis, construct and shade the region ***R*** that satisfies all the three inequalities.

c. If the profit obtained from the sale of a Super and a deluxe television are RM 900 and RM 1 200 respectively, find the maximum profit made by the factory daily.

2. Nazaruddin Trading import two types of hendkerchief from Korea, grade A and grade B, which are sold to the local retailers at the price of RM 1.50 and RM 1.00 per piece respectively. There are at least 200 grade A handkerchiefs sold per day, but the number of grade B handkerchiefs sold per day is at most 500. The total sales of hankerchiefs per day is not more than RM 810.

   a. Write a system of inequalities that satisfy the above situation,
   b. Sketch on the graph paper, the feasible region that represents these conditions,
   c. If the profit they can make from each grade A and grade B handkerchiefs are RM0.60 and RM0.60 respectively, find the number of gred A and grade B handkerchiefs that they must sell to obtain the maximum profit.

3. A washing machine manufacturer produces two models of washing machines, model A and model B. To produce washing machine A, 4 kg of metal and 3 minutes of man power are needed. To produce washing machine B, 3 kg of metal and 6 minutes of man power are needed. There are 1 200 kg of metal and at least 20 hours of man power avalable per day to produce these washing machines.

   a. Write a set of inequalities that describe the given situation.
   b. Sketch on the graph paper, the feasible region that represents these conditions.
   c. If the profit obtained from the sale of washing machine A and washing machine B are RM 150 and RM 250 respectively, find the number of washing machine A and the number of washing machine B that must be produced in order to maximise the manufacturer's profit.

4. Ashuri Music Centre offers piano and guitar lessons. The cost for piano and guitar lessons are RM 120 and RM80 a month respectively. The number of students who take piano lessons is not more than 30 and the total number of student in the centre is not more than 60. It is given that the number of students who take guitar lessons is at most 30 more than the number of students who take piano lessons.

   a. Write a system of inequalities to represent the above situation.
   b. Draw the graphs for the system of inequalities and shade the required region that describes the above situation.
   c. From the graph, find the optimal number of students for each type of lessons in order to obtain the maximum fee collected monthly.

5. Encik Zaki sell two types of burger, fish burger and chicken burger, in a stall in Gombak. The number of chicken burgers he sells per day is not more than two times the number of fish burgers. The total number of burgers he sells per day is not more than 50. The number of fish burgers he sells per day is not more than 20. Let x be the number of fish burgers sold and y be the number of chicken burgers sold.

   a. Write down a system of inequalities to represent the above situation.
   b. Draw the graphs of the system of inequalities and shade the required region that represents the above situation.
   c. If the profit obtained from the sale of each fish burger and chicken burger are RM0.60 and RM0.40 respectively, find the maximun and minimum profit that he can make in a day.

MODUL TOPIKAL

GEOMETRY COMPONENT

TOPICS	2003		2004		2005		2006		2007	
	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2
Coordinate Geometry	6	10	6	6	2	10	3	10	6	6
Vector	9	6	8	10	5	8	6	7	7	10
TOTAL MARKS	31		30		25		26		29	

COORDINATE GEOMETRY

Paper 1

1. The equations of two straight lines are $\frac{y}{7}+\frac{x}{3}=2$ and $7y=-3x+21$. Determine whether the lines are perpendicular to each other.

2. The points A $(3k, k)$, B (p,w) and C $(3p,2w)$ lie on a straight line. B bevides AC in the ratio 3 : 2. Express p in terms of w.

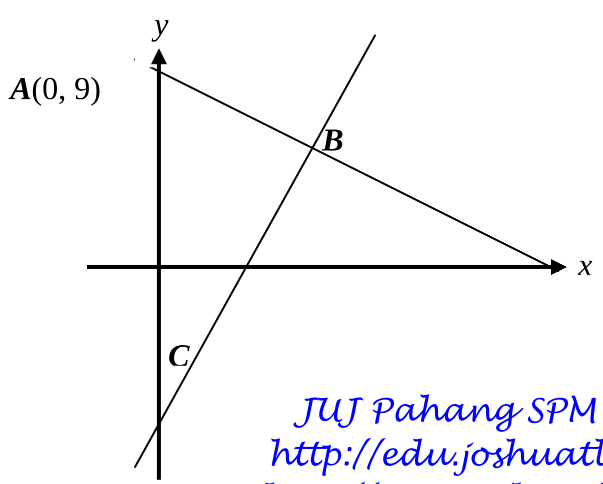
3. The point A is (-2, 4) and the point B is (5,6). The point P moves such that $PA:PB$ = 2:3. Find the equation of the locus of P.

4. Given A (3, 6) and B (1, -4), find the equation of the perpendicular bisector of AB.

5. Point Q moves on the Cartesian plane such that its distance from A(-3, -4) is always 6 units. Find the equation of the locus of Q.

6. R is a point on the line that joins P (-3, -6) and Q (6, 9) such that PR : RQ = 2: 5. Find the coordinates of R.

7. The diagram shows the straight line AB which is perpendicular to the straight line CB at the point B. The equation of the straight line CB is $y=4x-6$. Find the coordinates of B.



8. The following information refers to the equations of two straight lines, EF and GH, which are perpendicular to each other.

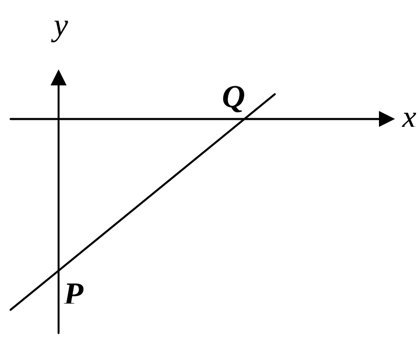
$EF: y = 2tx + k$
$GH: y = (k-3)x + t$
where k and r are constants

Express t in terms of k.

9. Find the distance between point (4, -9) and midpoint of the line joining P (5, 9) and Q(-3, 2).

10. The equations of the straight lines PQ and RS are $4x + y - 3 = 0$ and $\frac{x}{8} - \frac{y}{k} = 1$. If *PQ* and *RS* are parallel, find the value of *k*.

11.



In the diagram, *PQ* is a straight line with the equation $\frac{x}{3} - \frac{y}{6} = 1$. Find the area of triangle *OPQ*, where *O* is the origin.

12. Find the equation of the straight line that passes through A$\left(\frac{1}{2}, \frac{3}{4}\right)$ and is parallel to the straight line $y = 3x + 2$.

13. Find the equation of the straight line that is perpendicular to the straight line $y = -\frac{2}{3}x + 5$ and passes through point (4, -3).

14. Given that the point $P(-2,3)$ divides the line segment $A(-4, t)$ and $B(r, 8)$ in the ratio $AP : PB = 1 : 4$, find the value of *r* and of *t*.

Paper 2

1. Four points possess coordinates *O*(0, 0), *A*(t, 1 – 3t), *B* (1 – 2t, 4 – t) and *C* (1 – 3t, t + 2). Determine the possible values of t if given
   a. AB is parallel to OC,
   b. OB is perpendicular to AC.

2. *ABCD* is a trapezium, where *AB* is parallel to *DC*. Given that the points *A*(1, t), *B* (3, 2t + 1), *C* $\left(t, 5\frac{1}{2}\right)$ and *D* (1, 2t), find the possible values of t. In the case where t > 0, calculate the area of *ABCD*.

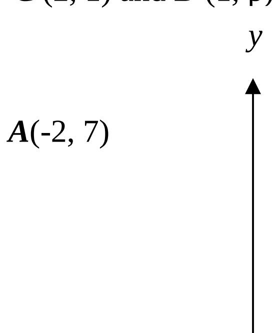
3. Three points possess the coordinates *A* (2, 3), *B* (4, 7), *C* (-1, 7). Point *D* and *C* lie on the same side with respect to the line segment AB. If the angle DBA = 90^o and the area of triangles *ACB* and *ADB* are equal, find
   a. the equation of the straight line that passes through *C* and is parallel to *AB*,
   b. the coordinates of *D*.

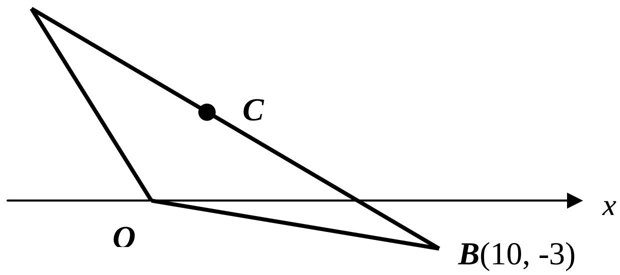
4. Given the points *A* (2,3) and *B* (8, 3), find
   a. the locus of *P* such that its distance from *A* is 5 units.
   b. The locus of *Q* that moves such that ists distances from *A* and *B* are equal. Hence, show that the two loci intersect at the points (5, 7) and (5, -1).

5. A and B are points (2, -3) and (5, 0) respectively,
   a. Show that the locus of P, that moves such that angle APB = 90^o, is $x^2 + y^2 - 7x + 3y + 10 = 0$
   b. Find the locus of Q that moves such that QA = Q.

6. Given that the area of the quadrilateral ABCD is 18 square units, where A (-2, 0), B (0, 3), C (2, 1) and D (1, p). Find the value of *p*.

7.





The diagram shows triangle *AOB* where *O* is the origin. Point *C* lies on the straight line AB.

a. Calculate the area, in unit2, of triangle *AOB*.

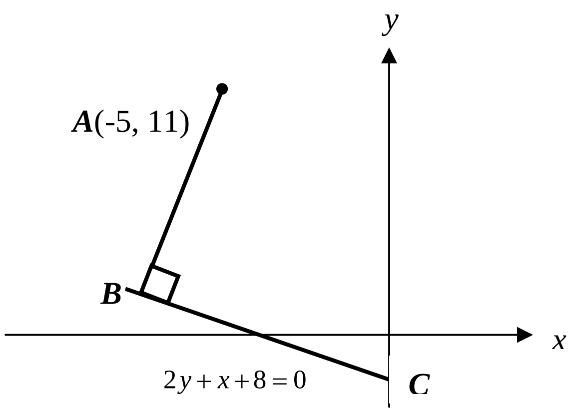
b. Given that *AC*:*CB* = 2: 3, find the coordinates of *C*.

c. *A* point *P* moves such that its distance from point *A* is always twice its distance from point *B*.

   i. Find the equation of the locus of *P*.

   ii. Hence, determine whether or not this locus cut the *y*-axis.

8.



In the diagram, $\angle ABC = 90°$ and the equation of straight line *BC* is $2y + x + 8 = 0$.

a. Find

   i. the equation of the straight line *AB*,

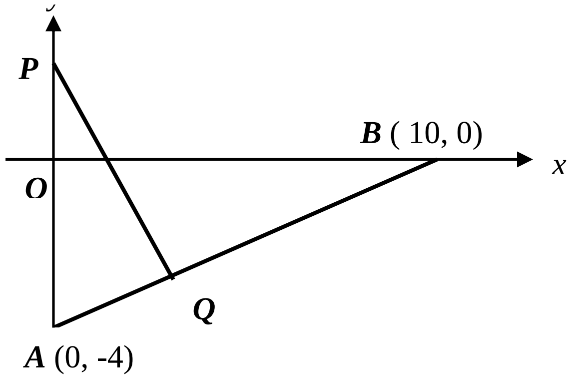
   ii. the coordinates of *B*.

b. The straight line *AB* is extended to a point D such that *AB* : *BD* = 2 : 3. Find the coordinates of *D*.

c. A point *Q* moves such that its distance from point *A* is always 6 units.

   Find the equation of the locus of *Q*.

9.



The diagram shows a straight line *PQ* which meets a straight line *AB* at the point *Q*. The point *P* lies on the *y*-axis.

a. Write down the equation of *AB* in the intercept form.

b. Given that *2AQ* = *QB*, find the coordinates of *Q*,

c. Given that *PQ* is perpendicular to *AB*, find the y-intercept of *PQ*.

10. A point *P* moves along the arc of a circle with centre G (2 , 3). The arc passes through A (-2, 0) and B(5, t).

a. Find

i. the equations of the locus of the point *P*,

ii. the values of *t*,

b. The tangent to the circle at point A intersects the y-axis at point *H*. Find the area of triangle *OAH*.

11. Given A(5,-2) and B(2,1) are two fixed points. Point *Q* moves such that the ratio of *AQ* to *QB* is 2:1.

a. Show that the equation of the locus of point Q is $x^2 + y^2 - 2x - 4y - 3 = 0$.

b. Show that point C(-1,0) lies on the locus of point *Q*,

c. Find the equation of the straight line *AC*,

d. Given the straight line *AC* intersects the locus of point *Q* again at point *D*, find the coordinates of point *D*.

Vectors
Paper 1

1. Given $\overrightarrow{OP} = \begin{pmatrix} -5 \\ -3 \end{pmatrix}$ dan $\overrightarrow{OQ} = \begin{pmatrix} 2 \\ 6 \end{pmatrix}$.

   a. $\overrightarrow{PQ}$

   b. the values of h and k such that $h\overrightarrow{OP} + k\overrightarrow{OQ} = \begin{pmatrix} 8 \\ 3 \end{pmatrix}$.

2. Given $\overrightarrow{TP} = \begin{pmatrix} 6 \\ 3 \end{pmatrix}$ dan $\overrightarrow{TQ} = \begin{pmatrix} -2 \\ -3 \end{pmatrix}$.

   a. $\overrightarrow{QP}$

   b. the values of m and n such that $m\overrightarrow{OP} + n\overrightarrow{OQ} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$.

3. Given $\underset{\sim}{a} = \begin{pmatrix} 3p+2 \\ 9 \end{pmatrix}$ and $\underset{\sim}{b} = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$. Calculate the value of p if

   a. $\left|\underset{\sim}{a} - \underset{\sim}{b}\right| = 12$,

   b. $\underset{\sim}{a}$ and $\underset{\sim}{b}$ are parallel.

4. Given $\underset{\sim}{a} = \begin{pmatrix} 3 \\ 8 \end{pmatrix}$ and $\underset{\sim}{b} = \begin{pmatrix} -2 \\ 5 \end{pmatrix}$.

   a. Express $\underset{\sim}{a} + 2\underset{\sim}{b}$ in the form of $x\underset{\sim}{i} + y\underset{\sim}{i}$

   b. If $2\underset{\sim}{a} = \underset{\sim}{b} - 3\underset{\sim}{c}$, express $\underset{\sim}{c}$ as a column vector.

5. Given $\underset{\sim}{a} = 4\underset{\sim}{i} + 3\underset{\sim}{j}$, $\underset{\sim}{b} = 3\underset{\sim}{i} - 2\underset{\sim}{j}$ and $\underset{\sim}{c} = -4\underset{\sim}{i} - 5\underset{\sim}{j}$. Find

   a. $2\underset{\sim}{b} - 3\underset{\sim}{c}$,

   b. $\left|c - 4b - 3a\right|$

   c. unit vector of $2a - 8\underset{\sim}{b}$

6. Given $\underset{\sim}{a} = 7\underset{\sim}{i} + 3\underset{\sim}{j}$, $\underset{\sim}{b} = 3\underset{\sim}{i} + 6\underset{\sim}{j}$ and $\underset{\sim}{c} = -4\underset{\sim}{i} - 9\underset{\sim}{j}$. Find

   a. $2\underset{\sim}{c} - 3\underset{\sim}{a}$,

   b. $\left|3c + b - 4a\right|$

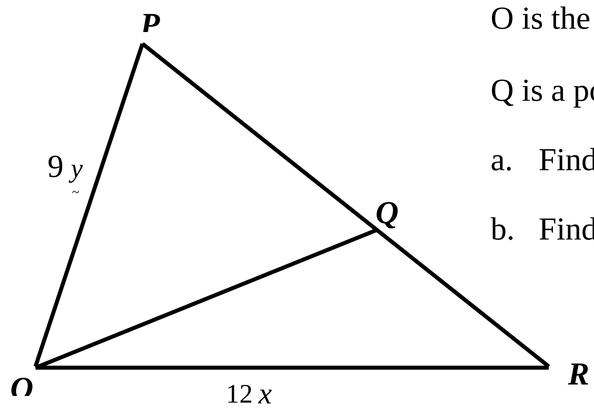
   c. unit vector of $4a + 8\underset{\sim}{b} - \underset{\sim}{c}$

7. Given P(1, 3), Q (5, 2) and O is the origin. If $\underset{\sim}{a} = \underset{\sim}{i} + 3\underset{\sim}{j}$, $\underset{\sim}{b} = 3\underset{\sim}{i} - 2\underset{\sim}{j}$, $\overrightarrow{PQ} = 2ha + 3k\underset{\sim}{b}$, find the values of h and k.

8. Given P(1, 7), Q (5, 3) and O is the origin. If $\underset{\sim}{a} = -2\underset{\sim}{i} + 8\underset{\sim}{j}$, $\underset{\sim}{b} = 3\underset{\sim}{i} - 2\underset{\sim}{j}$, $\overrightarrow{PQ} = \frac{1}{2} m\underset{\sim}{a} - 3n\underset{\sim}{b}$, find the values of *m* and *n*.

9. Given P(6, 3), Q (10, -2) and O ia the origin. If $\underset{\sim}{a} = 2\underset{\sim}{i} + 3\underset{\sim}{j}$, $\underset{\sim}{b} = 3\underset{\sim}{i} - \underset{\sim}{j}$, $\overrightarrow{PQ} = 2h\underset{\sim}{a} + k\underset{\sim}{b}$, find the values of *h* and *k*.

10.



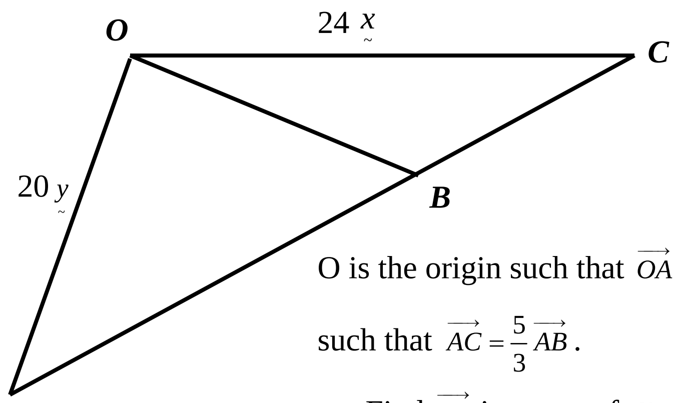
O is the origin such that $\overrightarrow{OP} = 9\underset{\sim}{y}$ and $\overrightarrow{OR} = 12\underset{\sim}{x}$.

Q is a point such that $\overrightarrow{PQ} = \frac{3}{2}\overrightarrow{QR}$.

a. Find $\overrightarrow{PR}$ in terms of $\underset{\sim}{x}$ and $\underset{\sim}{y}$.

b. Find $\overrightarrow{OQ}$ in terms of $\underset{\sim}{x}$ and $\underset{\sim}{y}$.

11.



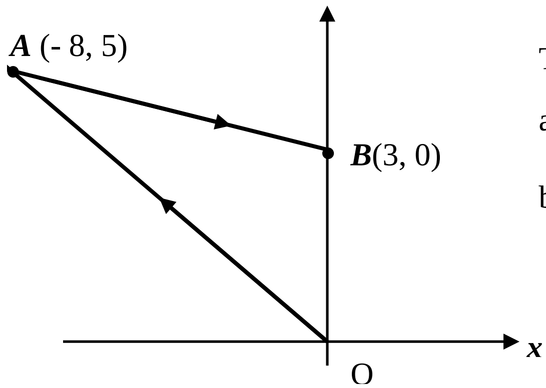
O is the origin such that $\overrightarrow{OA} = 20\underset{\sim}{y}$ and $\overrightarrow{OC} = 24\underset{\sim}{x}$. B is a point such that $\overrightarrow{AC} = \frac{5}{3}\overrightarrow{AB}$.

a. Find $\overrightarrow{CA}$ in terms of $\underset{\sim}{x}$ and $\underset{\sim}{y}$.

b. Find $\overrightarrow{BO}$ in terms of $\underset{\sim}{x}$ and $\underset{\sim}{y}$.

y

12.



The diagram shows two vectors, . Express

a. $\overrightarrow{OA}$ in the form $\begin{pmatrix} x \\ y \end{pmatrix}$

b. $\overrightarrow{AB}$ in the form $x\underset{\sim}{i} + y\underset{\sim}{i}$

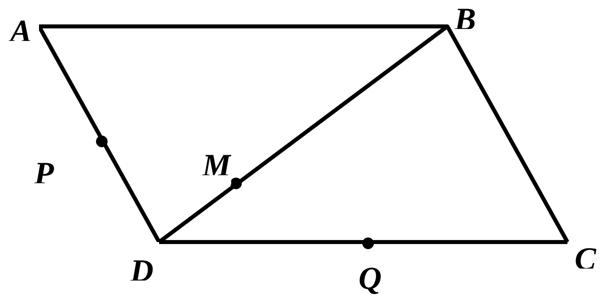
Paper 2

1. *O*, *A*, *B* and *C* are four points such that $\overrightarrow{OA} = \begin{pmatrix} 3 \\ 5 \end{pmatrix}$, $\overrightarrow{OB} = \begin{pmatrix} -1 \\ 3 \end{pmatrix}$ and $\overrightarrow{OC} = \begin{pmatrix} 5 \\ -3 \end{pmatrix}$. If *D* is a point on *AB* such that *AD* = *DB*, find

   a. $\overrightarrow{DC}$

   b. $\left|\overrightarrow{DC}\right|$

2.



In the diagram above, $\overrightarrow{DA} = 3\underset{\sim}{a}$ and $\overrightarrow{CD} = 4\underset{\sim}{b}$. P and Q are midpoints of AD and DC respectively. *M* ia a point on *DB* such that *DM* : *MB* = 1 : 3. Express the following vectors in term of $\underset{\sim}{a}$ and $\underset{\sim}{b}$.

a. $\overrightarrow{DP}$

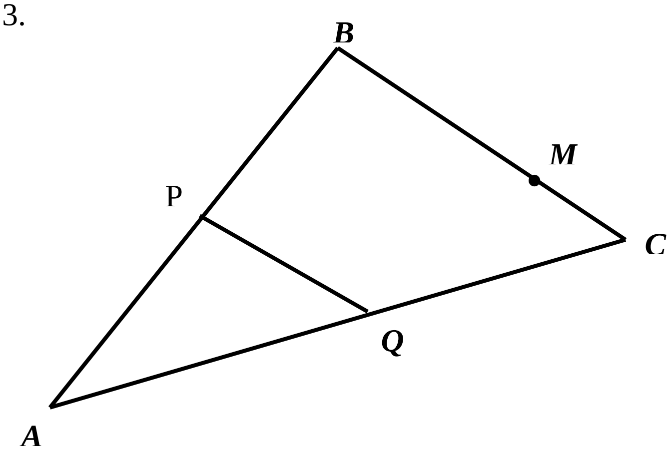
b. $\overrightarrow{DM}$

c. $\overrightarrow{AQ}$

d. $\overrightarrow{MC}$

e. $\overrightarrow{PB}$

3.



In the diagram above, $\overrightarrow{AB} = \underset{\sim}{a}$ and $\overrightarrow{AC} = \underset{\sim}{b}$. P and Q are midpoints of AB and AC respectively. *M* ia a point on *BC* such that *BM : BC* = 3 : 4. Express the following vectors in term of $\underset{\sim}{a}$ and $\underset{\sim}{b}$.

a. $\overrightarrow{AP}$

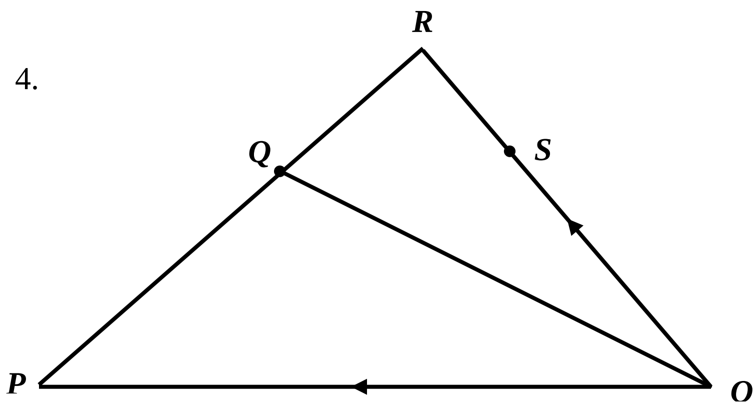
b. $\overrightarrow{AQ}$

c. $\overrightarrow{PQ}$

d. $\overrightarrow{AM}$

e. $\overrightarrow{QM}$

4.



In the diagram above, $\overrightarrow{OP} = 8\underset{\sim}{x}$ and $\overrightarrow{OR} = 12\underset{\sim}{y}$. Q and S is a point on PR and OR respectively such that $PQ : PR = 4 : 7$ and $RS : SO = 2 : 3$. Express the following vectors in term of x and y.

a. $\overrightarrow{PQ}$

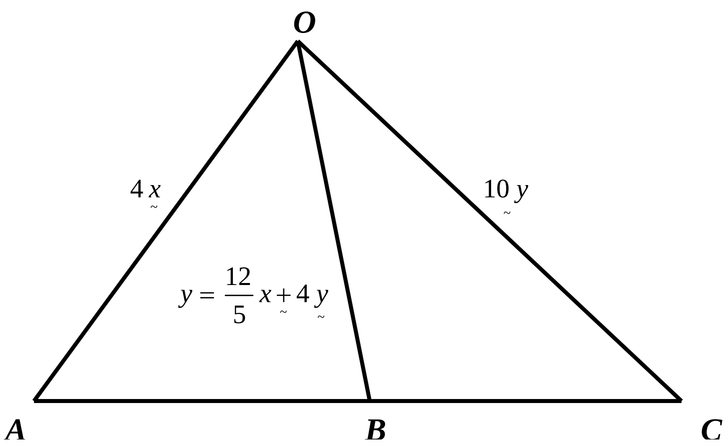
b. $\overrightarrow{RS}$

c. $\overrightarrow{PS}$

d. $\overrightarrow{SQ}$

e. $\overrightarrow{QO}$

5.



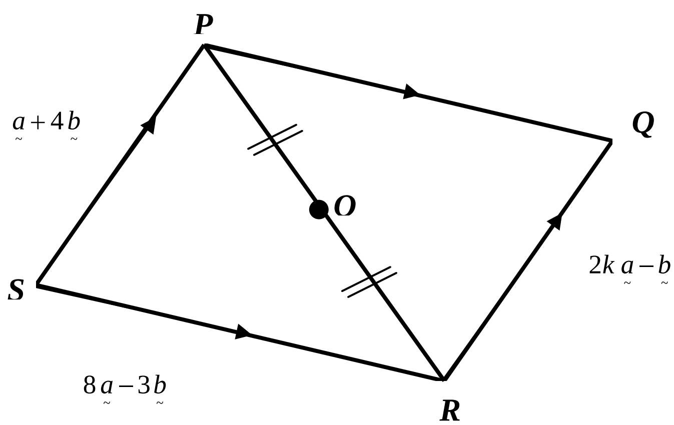
In the diagram above, ABC is a straight line. Given $\overrightarrow{OA} = 4\underset{\sim}{x}$, $\overrightarrow{OC} = 10\underset{\sim}{y}$ and $\overrightarrow{OB} = \frac{12}{5}\underset{\sim}{x} + 4\underset{\sim}{y}$. Find the ratio of AB : BC.

6. Given two vectors $\overrightarrow{AB} = \frac{3}{2}\underset{\sim}{i} - \frac{9}{4}\underset{\sim}{j}$ and $\overrightarrow{BC} = (2m-6)\underset{\sim}{i} + (1-m)\underset{\sim}{j}$, where m is a constant. If the point A, B and C are collinear, find

a. the value of *m*,

b. the ratio of *AB* : *BC*.

7.



In the diagram, O is the midpoint of PR, $\overrightarrow{SP} = \underset{\sim}{a} + 4\underset{\sim}{b}$, $\overrightarrow{SR} = 8\underset{\sim}{a} - 3\underset{\sim}{b}$ and $\overrightarrow{RQ} = 2k\underset{\sim}{a} - \underset{\sim}{b}$ where *k* is a constant.

a. Express in terms of and. $\underset{\sim}{a}$ or $\underset{\sim}{b}$

i. $\overrightarrow{RP}$

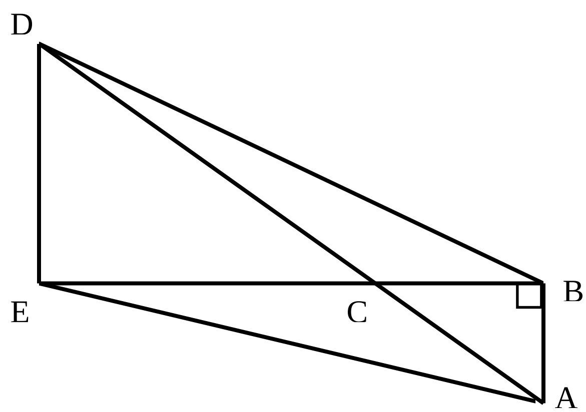
ii. $\overrightarrow{PO}$

iii. $\overrightarrow{OS}$

b. Express $\overrightarrow{SQ}$ in terms of $\underset{\sim}{a}, \underset{\sim}{b}$ *and* k.

c. If the points S, O and Q are collinear, find the value of *k*.

8.



In the diagram above, *ED* is parallel to *AB*, and *AD* and *BE* intersect at *C*. Given $\overrightarrow{EB} = 3\underset{\sim}{x}$, $\overrightarrow{ED} = 10\underset{\sim}{y}$ and $\overrightarrow{ED} = 5\overrightarrow{AB}$.

a. Express the following vectors in terms of $\underset{\sim}{x}$ and $\underset{\sim}{y}$.

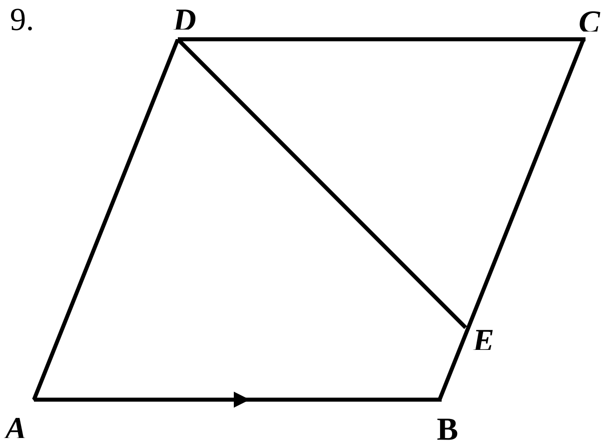
i. $\overrightarrow{BD}$,

ii. $\overrightarrow{AD}$.

b. Find the values of *m* and *n* such that $\overrightarrow{CD} = (m-1)\overrightarrow{AD}$ and $\overrightarrow{CD} = n\overrightarrow{EB} + \overrightarrow{BD}$.

c. Find $\left|\underset{\sim}{y}\right|$ if the area of ΔEBA is 45 cm^2, $\angle EBA = 90^\circ$ and $\left|\underset{\sim}{x}\right| = 5$ cm.

9.

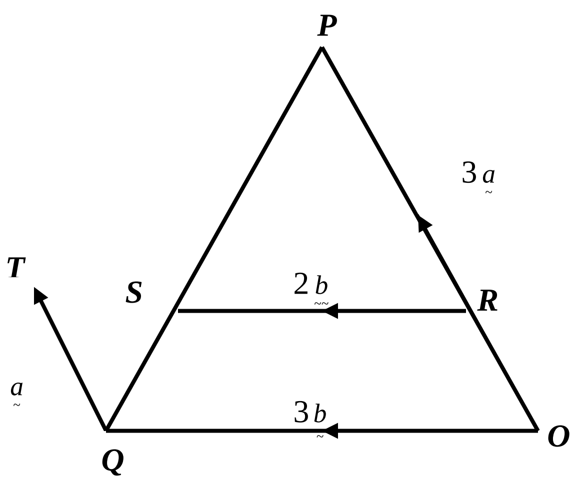


In the diagram above, *ABCD* is a rhombus, *E* ia a point on *BC* such that *BE*:*BC* = 1 : 4. Given $\overrightarrow{AB} = 5\underset{\sim}{i} + 3\underset{\sim}{j}$ and $\overrightarrow{AD} = 7\underset{\sim}{i} + 5\underset{\sim}{j}$. Find

a. $\overrightarrow{AC}$, $\overrightarrow{DE}$, $\overrightarrow{BE}$ and $\overrightarrow{CE}$,

b. $\left|\overrightarrow{AD}\right|$

10.



In the diagram above, *OPQ* is a triangle. Given $\overrightarrow{OQ} = 3\underset{\sim}{b}$, $\overrightarrow{RS} = 2\underset{\sim}{b}$, $\overrightarrow{OP} = 3\underset{\sim}{a}$ and $\overrightarrow{QT} = \underset{\sim}{a}$.

a. Find in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$

i. $\overrightarrow{QP}$, $\overrightarrow{QS}$, $\overrightarrow{ST}$ and $\overrightarrow{PT}$,

b. Show that *R*, *S* and *T* are collinear.

A

11.

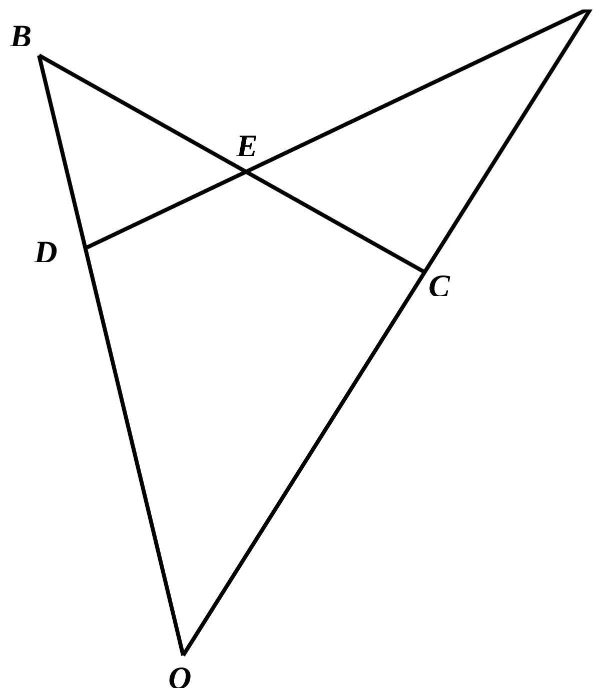


Diagram above, *C* is the midpoint of *OA* and *D* is a point on *OB* such that *OD* : *DB* = 2 : 1.

Given $\overrightarrow{OC} = \underset{\sim}{c}$, $\overrightarrow{OD} = \underset{\sim}{d}$, $\overrightarrow{BE} = m\,\overrightarrow{BC}$ and $\overrightarrow{DE} = n\,\overrightarrow{DA}$.

a. Find $\overrightarrow{OE}$ in term of $\underset{\sim}{c}, \underset{\sim}{d}, m$ and n using

   i. ΔOEB

   ii. ΔOEA

b. Hence, find the values of *m* and *n*,

c. Show that $\overrightarrow{EA} = 3\,\overrightarrow{DE}$

ANSWER FUNCTION

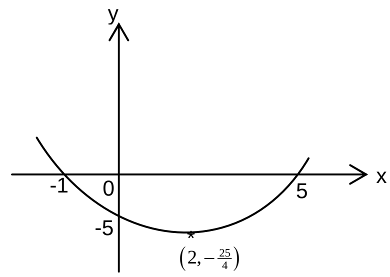
Paper 1

1. $p = 4$
2. $h^{-1} : x \to \frac{x+3}{2-x}, x \neq 2$
3. $gf(x) : x \to -\frac{2}{x}, x \neq 0$
4. $f^2 : x \to \frac{6x+6}{7+x}, x \neq -7$
5. $\frac{121}{2}$
6. $g : x \to 2x+1$
7. -7
8. $a = 2, \quad b = -5$
9. $p = 2, q = -5$
10. $fg : x \to 3x^2 - 7$
11. $p = \frac{5}{7}$
12. $p = \frac{1}{2}, q = 3$
13. $f : x \to x^2 + 3$
14. $x = 0, -1$
15. $p = 2$
16. $x = 1$
17. $f^{-1} : x \to \frac{x-2}{3}$
18. $-5 < x < 6$
19. $x = -\frac{3}{4}, \frac{9}{4}$
20. $x = 1$
21. $x = -5, \quad 3$
22. $f(x) = 5 + 2x$
23. a. $k = 3$
    b. $p = 6$
    c. $f^{-1}(x) = \frac{3x+6}{x-2}, x \neq 2$
24. a. $g : x \to x^2 - 7$
    b. 0
    c. $x = 4, -1$
25. $h = 3, \quad k = 4$

Paper 2

1. a. $f(x) = x^2 - 2$
   b. $k = -2 \;, 4$

2.



3. a. $x = 3$
   b. i. {student, teacher, doctor}
      ii. {school, hospital}

4. a. i. $fg^{-1}(x) = 3x - 20$
      ii. $x = -\frac{1}{3}$
   b. i. $h = 10, k = 5$
      ii. $m = -1 \;, 6$

5. a. i. $f^{-1}(x) = \frac{p-x}{q}$
      ii. $p = 6, q = 2$
   b. $f^{-1}g^{-1}(x) = \frac{x+15}{6}$

6. a. i. many to one
      ii. { f, g}
   b. $a = -11$

7. a. $a = 1, b = -2$
   b. $m = 10$

8. a. $f(x) = 3x + 4$
   b. $f(x) = 2 - 3x^2$
   c. $m = 4, k = \frac{1}{6}$

9. a. i. $\frac{11}{2}$
   ii. $k = -\frac{1}{2}$
   b. $m = 16, n = -\frac{25}{17}$

10. a. i. $f^{-1}g(x) = \frac{x - 11}{6}$
   ii. $h(x) = 18x + 36$
   b. $p = 4$

ANSWER FUNCTION

Paper 1

1. $x = -6, 2$
2. 5^{2n}
3. $x = 125$
4. $x = -4.301$
5. $x = 6$
6. 60
7. $x = \frac{27}{y^2}$
8. $2y - x + 1$
9. $x = 4$
10. $y = \frac{1}{9}$
11. $x = 13$
12. 1.442
13. $\frac{3}{2}$
14. $x = 1$
15. $p = -2, 6$
16. $k = \sqrt{\frac{32}{w}}$
17. $p = 4.226$
18. a. 2^{2m+2n}
    b. 2^{m-4n}
19. $\frac{1}{3m} + \frac{1}{2n}$
20. $y = \frac{1}{9}$
21. $x = \frac{1}{2}$
22. $\sqrt{27}$
23. a. 5.904
    b. 0.768
24. $x = 2, y = -1$
25. $n = 1$

Paper 2

1. a. $\frac{13}{2}$
   b. $h - k + 1$

2. a. $m + n - 4$
   b. $x = 5$
   c. $t = 3$

3. a. $x = -\frac{1}{2}$
   b. $x = -\frac{2}{5}$
   c. $x = 6$

4. a. $x = 4$
   b. $n - m + 1$
   c. $x = \frac{9}{5}$

5. a. $x = -1$
   b. $n = 2$
   c. $x = -2, 6$

6. a. $x = \frac{9}{2}$
   b. $x = 1$
   c. $x = \frac{9}{8}$

7. a. $y = 16x^2$
   b. 1.447
   c. $x = -\frac{1}{4}$

8. a. $x = 2$
   b. $x = \frac{5}{12}a$
   c. $x = \frac{16}{13}$

9. a. $x = -2$

b. $y = \frac{4}{x^2}$

c. $x = \frac{1}{4}$

10. a. $x = 2$

b. $x = 4.327$

c. $x = -\frac{3}{2}$

ANSWER FUNCTION

Paper 1

1. $\log y = -2p \log x + \log q$

$m = -2p, \quad c = \log q$

2. $\log y = qx + \log p$

a. $gradient = q$

b. $y-intercept = \log p$

3. $y = k\left(\frac{y}{x}\right) + h$

a. $gradient = k$

b. $y-intercept = h$

4. $\log y = -b \log 3\left(\frac{1}{x}\right) + \log a$

$m = -b \log 3, \quad c = \log a$

5. $\frac{1}{y} = -\frac{1}{c}x + \frac{d}{c}$

a. $gradient = -\frac{1}{c}$

b. $y-intercept = \frac{d}{c}$

6. $\frac{y}{x} = hx^2 + k$

h=4 , k = 2

7. $m = 16, \quad n = -\frac{1}{2}$

8. $k = 10$

9. $n = -1, \quad k = 10$

10. $m = 1, \quad k = 27$

11. $y = -6x + 3$

12. $y = \frac{4x}{-1+6x}$

13. $h = 6, k = 10$

14. $a = \frac{1}{100}, n = 3$

15. $y = 0$

16. $h = 5, k = 4$

17. $p = -\frac{1}{2}, q = 7$

18. $p = 13, q = -3$

19. $a = \frac{5}{2}, b = \frac{2}{3}$

20. $y = 10^{-3x+4}$

Paper 2

1. a.

1-x	0.7	0.6	0.5	0.3	0.2	0.1
lg y	0.35	0.42	0.48	0.54	0.61	0.73

b. i. p = 1.62

ii. k = 0.20

2. a.

x+1	2	3	4	5	6	7
lg y	0.60	0.76	0.94	1.12	1.30	1.46

b. i. m = 0.00513

ii. n = 1.445

3. a.

x	2	4	6	8	10
$\frac{y^2}{x}$	3.98	6.03	8.19	10.17	12.54

b. i. a = 1.93 , b = 1.025

ii. k = 0, 0.87

4. a. i. 26.05
ii. p = 3.98, q = 1.088
iii. x = 3.96

b. $Y = \frac{x}{y}$, $X = x$

5. a. Graph
b. i. $k = 2.512$
ii. $h = 0.019$

6. a. Graph
b. i. $a = 8.9$
ii. $b = -13.8$

7. a. Graph
b. i. $p = 1.820$
ii. $k = 1.318$

8. a. Graph
b. i. $p = 2$
ii. $m = 0.4$
iii. $y = 5.06$

9. a. Graph
b. i. a = 1.193
ii. b.=1.105

10. a. Graph
b. i. $p = 2.24$
ii. $k = 1.514$

ANSWER FUNCTION

Paper 1

1. 23
2. $69n$
3. $n = 106$
4. $k = -6, 2$
5. $d = 3$
6. $S_n = 13n - 2n^2$
7. $n = 6$
8. $d = 18$
9. $a = 17, \ d = -2$
10. $d = 4$
11. $n = 20$
12. 8.210
13. -384
14. $n = 10$
15. $a = \frac{9}{2}, \ r = \frac{2}{3}$
16. 40.5
17. $\frac{7}{4}$
18. a. $x = 5$
    b. 1470
19. $T_n = 12n - 3$
20.
21. $\frac{3}{4}$
22. $\frac{17}{37}$
23. $r = \frac{1}{4} \ or \ \frac{3}{4}$
24. $r = -\frac{5}{3} \ or \ \frac{2}{3}$
25.

Paper 2

1. a. 9521
   b. n=10

2. a. 2.25
   b. 576
   c. n = 9

3. a. 270.47
   b. 25, 31, 37

4. a. prove , $r = \frac{1}{8}$
   b. $n = 5$
   c. 29.26

5. a. $p = 50$
   b. 1160π

6. a. 60
   b. n = 3

7. a. 2
   b. 7

8. a. $a = 64, r = \frac{1}{2}$
   b. 128

9. a. prove , $d = \log_{10} q$
   b. $\log_{10}(pq)^{10}$

10. a. 1685.4
    b. n = 14

ANSWER FUNCTION

1. $p = -12$
2. $x = 2, 3$
3. $p = 2$
4. $p = -6, 6$
5. $p = 20$
6. $\alpha = -2, p = -6$
7. *distinct roots*
8. $2x^2 - x - 1 = 0$
9. $x = -4, \frac{3}{2}$
10. $p = 18$
11. $x = 3.608, -1.109$
12. $k = -18$
13. $m = \pm\frac{5}{6}$
14. $p = -3, 4$
15. $k = 0, 12$
16. $m = -2$
17. $k = -1, 7$
18. $x = -2.703, \; 0.3699$
19. $p < 11$
20. $2x^2 - 5x + 2 = 0$
21. $k = -4, m = -2, 3\; n = 3, -2$
22. a. $k = 4, -\frac{20}{9}$

    b. $k < -\frac{20}{9}, k > 4$
23. $k = -1, \; \frac{3}{2}$
24. $p : q = 5 : 6$
25. a. $p = -\frac{9}{2}, q = -\frac{10}{3}$

    b. $k < -57$

Paper 2

1. a. $-1, 3$

   b. $-5, 2$

2. a. $\sqrt{3m}$

   b. i. prove

   ii. $x = 67.87$

   iii. 1696.77

3. a. $2x^2 + 5x - 9 = 0$

   b. $m = -1, 4$

4. a. $p = 2, k = 15$

   b. $k = -2, 3$

5. a. $h = -2, -1$

   b. $m = -4, k = \frac{9}{4}$

6. a. $k = 6, m = \frac{5}{4}$

   b. $p = -2, q = -12$, $k \geq -\frac{25}{4}$

7. a. $2x^2 + 9x - 5 = 0$

   b. $2 < k < 6$

8. a. $m = -1, 7$

   b. $2x^2 + 5x - 3 = 0$

   c. $-0.2910, 2.291$

9. a. $k < -1, k > 7$

   b. $h = -\frac{1}{2}, k = -7$

10. a. $p < -\frac{9}{2}$

    b. $x = -0.1375, 3.637$

ANSWER FUNCTION

1. $x < -4, x > 1$
2. $x = \frac{7}{4}$
3. $x \le 0,\ x \ge \frac{8}{3}$
4. $p = -4, q = 3$
5.
6. $-\frac{1}{2} < x < 3$
7. $k < \frac{25}{8}$
8. $x > 1$
9. $m = 2,\ -\frac{2}{3}$
10. $x = -\frac{5}{4}$
11. $x < 2, x > 5$
12. $-7 < m < 1$
13. $x \le -5, x \ge 5$
14. Minimum point $\left(\frac{3}{5}, -4\right)$
15. $m < -4, m > 8$
16. $x < -\frac{5}{6}, x > 2$
17. $p = \pm 2$
18. $y = (x-3)^2 - 5$
19. $x < -\frac{1}{2}, x > 0$
20. $p < -5, p > 5$
21. $3 < x < \frac{7}{2}$
22. $x < -\frac{2}{3}$
23. a. $a = 2, b = -\frac{1}{4}, c = \frac{39}{16}$

    b. Graph
24. $p = 8, q = 18$
25. a. $p = 6, q = -2$

    b. graph

Paper 2

1. a. i. $p = 8, q = 18$

      ii. $x = 1$

      iii. $(1, -2)$

   b. $x \le -2, x \ge \frac{1}{2}$

2. a. $k = -5$

   b. i. $h = 3$

      ii. $x = 3$

      iii. $(3, 2)$

3. a. i. $p = 2$

      ii. $q = -7$

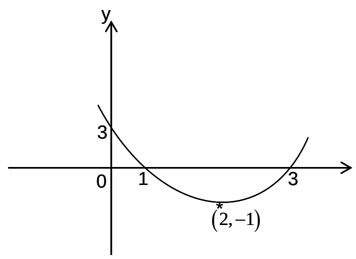
   b. $-2 - 4(x-1)^2$

4. a. i. $p = 9, q = 2$

      ii. $A(-1, 0), B(2, 0)$

   b. $-5 \le k \le 11$

5. a. $x \leq -\frac{1}{6}, x \geq 1$
   b. $m < -4, m > 1$
c.

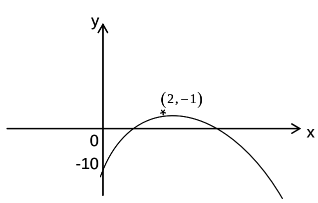


6. a. $k = -5$
   b. i. $\sqrt{3}$
      ii. $x = \sqrt{3}$
      iii. $\left(\sqrt{3}, 2\right)$

7. a. $-2 < x < 2$
   b. $x < 1, x > 2$

8. a. $p < 4, p > 6$
   b. $-4 < x < 1$

9. a. $p = -k, q = h + 2k^2$
   b. i. $x = 3$
      ii.



10. a. $p = -4$
    b. 2
    c. $x = 4$

ANSWER FUNCTION

1. $x = 4, 1 \quad y = -4, 2$

2. $x = 2, -\frac{2}{3} \quad y = 0, \frac{8}{3}$

3. $x = 3, 2 \quad y = 2, 3$

4. $x = -5, \frac{11}{3} \quad y = 2, -\frac{8}{9}$

5. $x = -\frac{1}{5}, \frac{3}{5} \quad y = \frac{2}{5}, \frac{6}{5}$

6. $x = \frac{1}{2}, \frac{7}{2} \quad y = -\frac{5}{2}, \frac{1}{2}$

7. $x = 3, -1 \quad y = -\frac{1}{2}, \frac{3}{2}$

8. $x = \frac{7}{2}, \frac{5}{2} \quad y = 1, 3$

9. $x = -4, \frac{8}{5} \quad y = 2, -\frac{4}{5}$

10. $x = -\frac{11}{9}, 1 \quad y = -\frac{17}{9}, 7$

11. $x = 9, -\frac{36}{17} \quad y = 1, -\frac{10}{17}$

12. $x = -1, \frac{2}{3} \quad y = 3, \frac{13}{6}$

13. $x = -1, -\frac{25}{2} \quad y = -\frac{11}{2}, -\frac{31}{2}$

14. $x = 3 \quad y = 2$

15. $x = -4, -1 \quad y = 10, -2$

16. $x = 5, -\frac{1}{7} \quad y = 2, \frac{2}{7}$

17. $x = 6 \quad y = 2$

18. $x = -2, \frac{1}{2} \quad y = 8, 3$

19. $P(4, -1), Q(1, -4)$

20. $k = -\frac{32}{5} \quad p = -\frac{5}{2}$

21. $l = 18, 22 \quad b = 22, 18$

22.a. $h = -4, k = 16$

b. $\left(\frac{59}{14}, \frac{12}{7}\right)$

23. $x = -16, 16 \quad y = -6, 2$

24. $p = 0.742, -6.742, q = 2.774, 25.226$

25. $x = \frac{1}{2}, \frac{2}{3}, y = \frac{3}{2}, 1$