

Mathematics

0580

Paper-2

Algebra

Exercise (M-19, M-18; S-19, S-18; W-18)

(with answers)

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← X ——— X ——— X ——— →

1. Factorise: (a) $7k^2 - 15k$ --- [1]

(b) $12(m+p) + 8(m+p)^2$ [M-19/22/Q13] --- [2]

2. Simplify. $\frac{ab - b^2}{a^2 - b^2}$ [M-19/22/Q19] --- [3]

3. Factorise $5y - 6py$ [S-19/21/Q22] --- [1]

4. Expand and simplify. $(x+1)(x+2) + 2x(x-3)$ [S-19/21/Q15] --- [3]

5. (a) Factorise $p^2 - q^2$ --- [1]

(b) $p^2 - q^2 = 7$ and $p - q = 2$ --- [2]

find the value of $p+q$ [S-19/21/Q17]

6. Write as a single fraction in its simplest form. $\frac{1}{x+2} - \frac{2}{3x-1}$ --- [3]

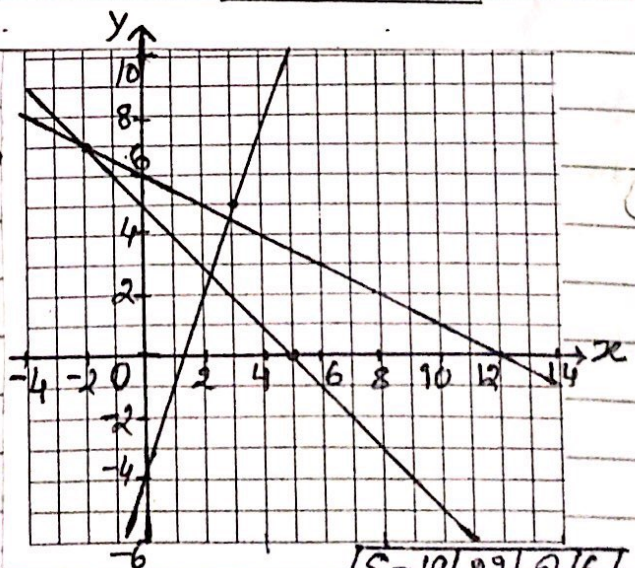
7. Solve the equation. $9f + 11 = 3f + 23$ [S-19/22/Q6] --- [2]

8. Solve the simultaneous equations: $5x + 8y = 4$
 you must show all your working. $\frac{1}{2}x + 3y = 7$ --- [3]

[S-19/22/Q14]

9. (a) By shading the unwanted regions of the grid, find and label the region R that satisfies the three inequalities.

$y \leq -\frac{1}{2}x + 6$; $y \geq 3x - 4$; $x + y \geq 5$ [2]



(b) Find the largest value of $x+y$ in region R, where x and y are integers, --- [1]

10. Write as a single fraction in its simplest form. $\frac{2x}{x+3} + \frac{x+3}{x-5}$ --- [3]

[S-19/22/Q17]

11. Rearrange this formula to make m the subject: $p = \frac{k+m}{m}$ --- [4]
 [S-19/22/Q19]

12. Solve the equation $3x^2 - 2x - 10 = 0$
 Show all your working and give your answers correct to 2 decimal places. --- [4]
 [S-19/22/Q20]

13. Factorise $2x^2 - x$ --- [1]
 [S-19/23/Q2]

14. Rearrange $2(w+h) = p$ to make w the subject. [S-19/23/Q10] --- [2]

15. Complete the statement with an expression in terms of m ,
 $18m^3 + 9m^2 + 14m + 7 = (9m^2 + 7)(\dots\dots)$ [S-19/23/Q11] --- [2]

16. One solution of the equation $ax^2 + a = 150$ is $x = 7$
 (a) Find the value of a --- [2]

(b) Find the other solution. [S-19/23/Q14] --- [1]

17. Simplify $\frac{2x^3 + 5x^2}{x^2 - 25}$, giving your answer as a single fraction. --- [3]
 [S-19/23/Q17]

18. Factorise completely, $15k^2m - 20m^4$ [M-18/22/Q6] --- [2]

19. Solve the simultaneous equations. $2x + \frac{1}{2}y = 13$ --- [3]
 You must show all your working. $3x + 2y = 17$
 [M-18/22/Q13]

20. Solve the equation $2x^2 + 7x - 3 = 0$ --- [4]
 Show all working and give your answer correct to 2 decimal places.
 [M-18/22/Q17]

21. Find the value of $7x + 3y$ when $x = 12$ and $y = -6$. [S-18/21/Q4] --- [1]

22. Expand and simplify, $6(2y - 3) - 5(y + 1)$ [S-18/21/Q8] --- [2]

23. Solve the inequality $3n - 5 > 17 + 8n$ [S-18/21/Q12] --- [2]

24. Expand $7(x - 8)$ [S-18/22/Q2] --- [1]

25. Complete these statements
 (a) when $w = \dots$, $10w = 70$ --- [1]

(b) when $5x = 15$, $12x = \dots$ --- [1]
 [S-18/22/Q4]

26. Factorise completely: $xy + 2y + 3x + 6$ [S-18/22/Q10] -- [2]
27. Factorise: $w + w^3$ [S-18/23/Q2] -- [1]
28. Solve: $\frac{1-p}{3} = 4$ [S-18/23/Q9] -- [2]
29. Factorise completely: $2a + 4b - ax - 2bx$ [S-18/23/Q10] -- [2]
30. $A = (2x + y)x^2$,
Rearrange the formula to make x the subject. [S-18/23/Q11] --- [2]
31. Simplify $\frac{3+x}{9-x^2}$ [S-18/23/Q13] [2]
32. Expand the bracket and simplify, $(2p+3)(3p-2)$ [S-18/23/Q18] -- [3]
33. Write as a single fraction in its simplest form:
 $\frac{1}{y-1} - \frac{1}{y}$ [S-18/23/Q21] --- [3]
34. Expand and simplify $(3x-7)(2x+9)$ [W-18/21/Q5] -- [2]
35. Find the integer values of n , that satisfies the inequality:
 $15 \leq 4n < 28$
[W-18/21/Q12] --- [3]
36. Write as a single fraction in its simplest form.
 $\frac{x-5}{3} + \frac{6}{x+2}$ [W-18/21/Q15] --- [3]
37. Solve the simultaneous equations, $2x + 3y = -12$ -- [4]
You must show all your working. $5x + 2y = 14$
[W-18/21/Q18]
38. Use the quadratic formula to solve the equation: $3x^2 + 7x - 11 = 0$
you must show all your working and give your answer correct to 2 decimal places. [W-18/21/Q19] -- [4]
39. Expand. $2x(3-x^2)$ [W-18/22/Q4] -- [2]
40. Solve: $7m - 2 \geq 19$ [W-18/22/Q6] -- [2]
41. Factorise, $xy + 5y + 2x + 10$ [W-18/22/Q8] -- [2]
42. Make m the subject of the formula, $x = \frac{3m}{2-m}$ -- [4]
[W-18/22/Q20]

43. Factorise: $y - 2y^2$ [W-18/23/Q2] -- [1]

44. Simplify, $2p - q - 3q - 5p$. [W-18/23/Q7] -- [2]

45. Solve $3w - 7 = 32$ [W-18/23/Q10] -- [2]

46. $A = \pi r l + \pi r^2$ -- [2]

Rearrange this formula to make l the subject. [W-18/23/Q11]

47. Write as a single fraction in its lowest form, $\frac{1}{x} - \frac{1}{x+1}$ -- [3]

[W-18/23/Q18]

48. Solve the equation $3x^2 - 2x - 2 = 0$, show all your working, and give your answers correct to 2 decimal places. [W-18/23/Q20] -- [4]

49. Simplify, $\frac{2x^2 - x - 1}{2x^2 + x}$ [W-18/23/Q22] -- [4]

50. Factorise completely, (a) $px + py - x - y$ -- [2]

(b) $2t^2 - 98m^2$ [W-18/23/Q25] -- [3]

51. $y = mx + c$ -- [2]

Find the value of y when $m = -2$, $x = -7$, and $c = -3$. [SP-20/02/Q5]

52. Rearrange the formula $5w - 3y + 7 = 0$ to make w the subject, ... [2]

[SP-20/02/Q9]

53. Solve the inequality: $n + 7 < 5n - 8$ [SP-20/02/Q13] -- [2]

54. Solve the simultaneous equations:
you must show all your working.

$$y = 5x^2 + 4x - 19$$

$$y = 4x + 1 \quad \text{-- [5]}$$

[SP-20/02/Q28]

1. Simplify: (a) $t^{21} \div t^7$ -- [1]

(b) $(u^5)^5$ [1]

[S-19/21/Q6]

2. (a) Simplify $(81y^{16})^{3/4}$ -- [2]

(b) $2^3 = 4^p$, find the value of p . [S-19/21/Q18] -- [1]

3. Simplify, (a) $5m^2 \times 2m^3$ -- [2]

(b) $(x^8)^3$ -- [1]

[S-19/22/Q12]

4. (a) $t^x \times t^2 = t^{10}$

Find the value of x . --- [1]

(b) Simplify (i) $(\frac{4}{x})^{-2}$ -- [1]

(ii) $a^3 b^7 \div a^6 b^2$ -- [2]

[W-18/21/Q17]

5. (a) Simplify $\frac{w^2}{w^3}$ -- [1]

(b) Simplify $(3w^3)^3$ -- [2]

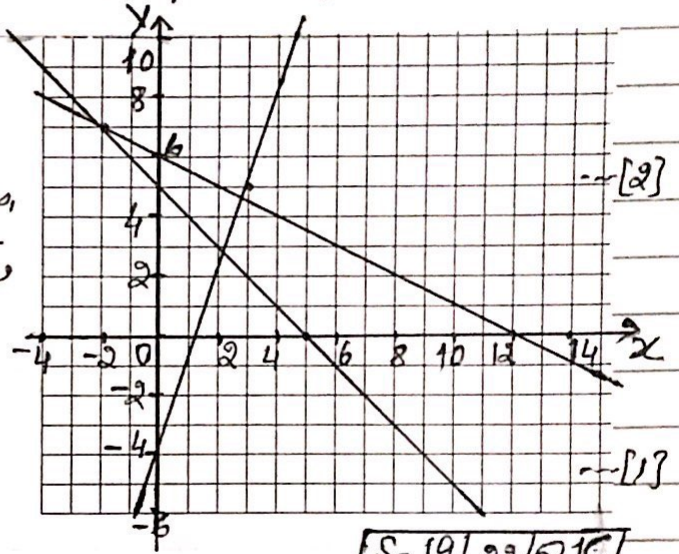
[W-18/23/Q16]

6. (a) Simplify $(27x^6)^{1/3}$ -- [2]

(b) Find the value of $(64x^4)^{0.5} \times 4x^{-2}$ -- [3]

[SP-20/02/Q27]

1.(a) By shading the unwanted regions of the grid, find and label the region R that satisfies the three inequalities,
 $y \leq -\frac{1}{2}x + 6$; $y \geq 3x - 4$; $x + y \geq 5$,

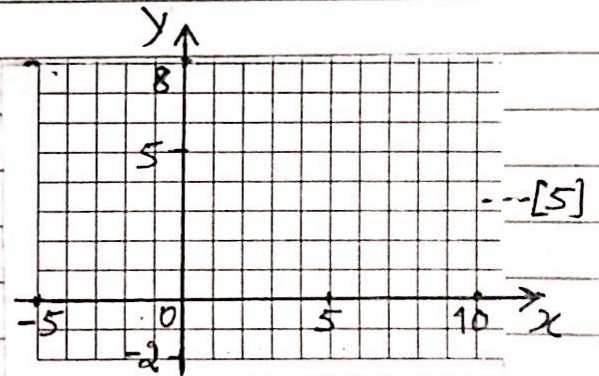


(b) Find the largest value of $x + y$ in the region R, where x and y are integers.

[S-19/22/Q16] ---[2]

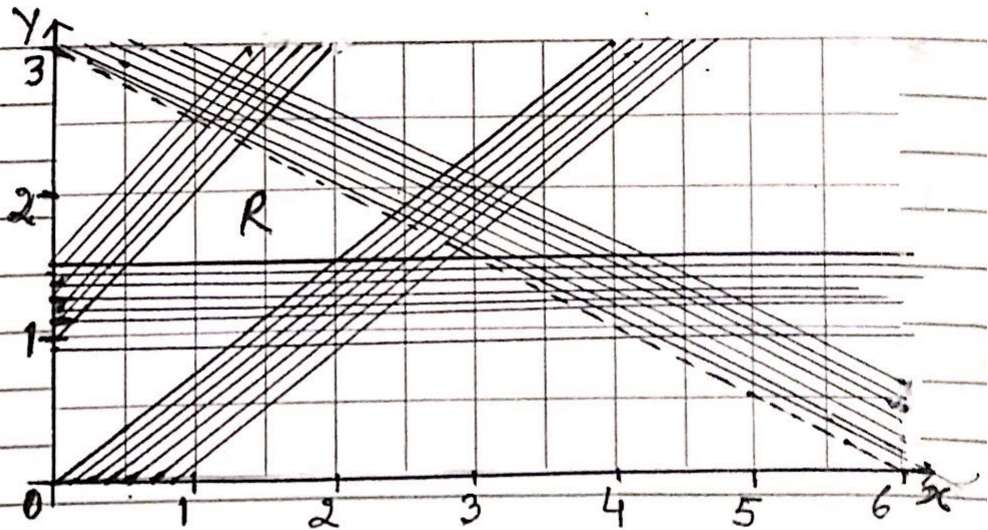
2 By shading the unwanted regions of the grid, draw and label the region R which satisfy the following three inequalities,

$y \leq 2$ $x < 3$ $y \leq x + 4$



[S-19/23/Q24] ---[5]

3.



There are four inequalities that define the region R

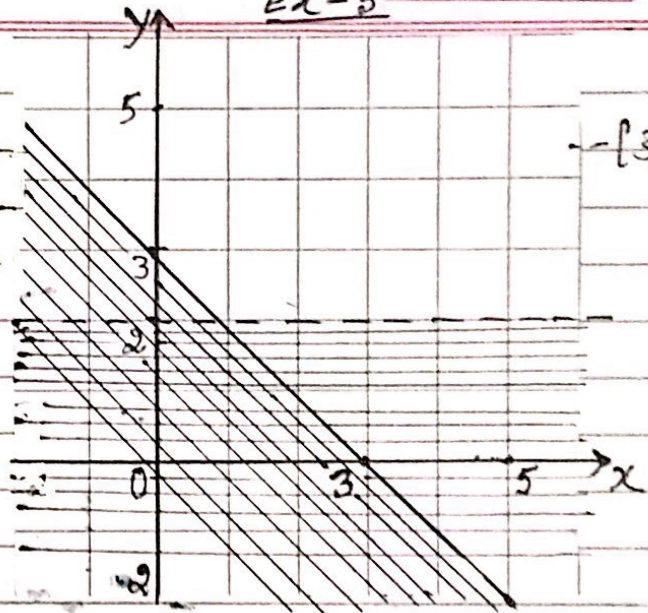
one of these is $y \leq x + 1$

Find the other three inequalities.

[S-18/21/Q21] ---[4]

EX-3

4. Find the two inequalities that define the region on the grid that is not shaded.

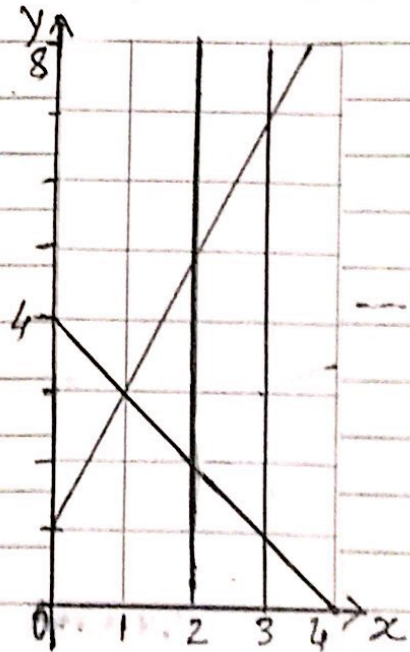


--- [3]

[S-18/22/Q19]

5. By shading the unwanted regions of the grid and label the region R that satisfies the following four inequalities.

$x \leq 3, x \geq 2, y \leq 2x+1, y \geq 4-x$



--- [3]

[W-18/22/Q14]

1. y is directly proportional to $(x-4)$
when $x=16$, $y=3$; find y in terms of x . [M-19/22/Q9/---[2]

2. y is inversely proportional to the square root of $(x+1)$. ---[3]
when $x=8$, $y=2$. find y when $x=99$. [S-19/21/Q16]

3. y is inversely proportional to the square of $(x+1)$. ---[3]
 $y=0.875$ when $x=1$,
Find y when $x=4$. [S-19/23/Q18]

4. y is inversely proportional to x ,
when $x=9$, $y=8$. Find y when $x=6$. [M-18/22/Q10/ ---[3]

5. y is directly proportional to $(x-1)^2$, when $x=5$, $y=4$
Find y when $x=7$. [S-18/21/Q15/---[3]

6. A ball falls d metres in t seconds. d is directly proportional to the square of t . The ball falls 44.1 m in 3 seconds.

(a) Find a formula for d in terms of t . ---[2]

(b) Calculate the distance the ball falls in 2 seconds. ---[1]
[S-18/22/Q18]

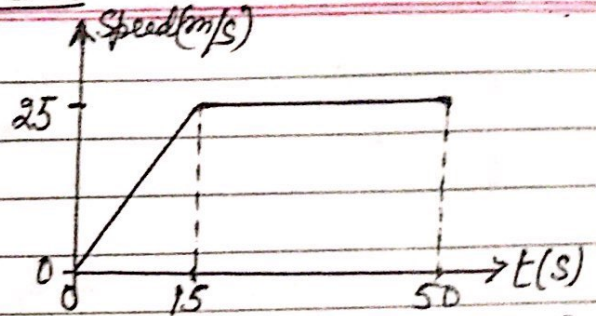
7. y is directly proportional to $(x-1)^2$
when $x=3$, $y=24$
find y when $x=6$. [S-18/23/Q19]---[3]

8. y is inversely proportional to x^3
when $x=2$, $y=0.5$
Find y in terms of x . [W-18/21/Q7/ ---[2]

9. y is directly proportional to the square root of x .
when $x=9$, $y=6$; find y when $x=25$. [W-18/23/Q17/ ---[3]

Exercise - 5

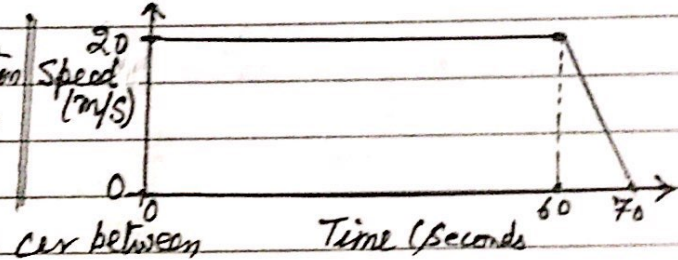
1. The speed-time graph shows the first 50 seconds of a journey. Calculate.



(a) the acceleration during the first 15 seconds. --- [1]

(b) the distance travelled in the 50 seconds. [M-19/22/Q22] --- [3]

2. The diagram shows information about the final 70 seconds of a car journey.

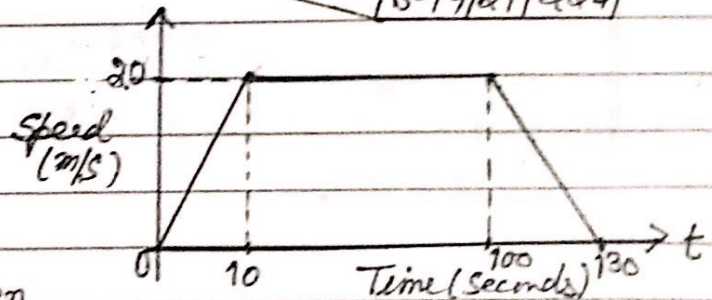


(a) Find the deceleration of the car between 60 and 70 seconds.

(b) Find the distance travelled by the car during the 70 seconds. --- [3]

[S-19/21/Q24]

3. The speed-time graph shows information about the journey of a tram between two stations.



(a) Calculate the distance between the two stations. --- [3]

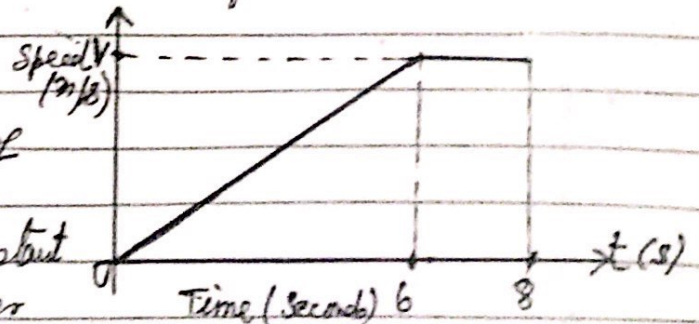
(b) Calculate the average speed of the tram for the whole journey. --- [1]

[S-18/31/Q17]

4. The diagram shows information about the first 8 seconds of a car journey.

The car travels with constant acceleration reaching a speed of v m/s after 6 seconds.

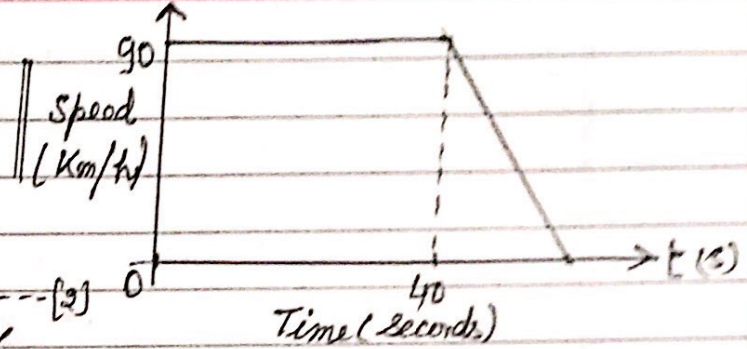
The car then travels at a constant speed of v m/s for a further 2 seconds. The car travels a total distance of 150 metres.



Work out the value of v .

[S-18/22/Q17] --- [3]

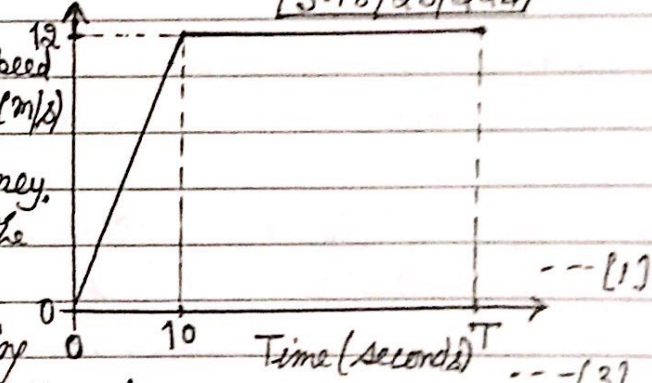
5. The diagram shows the speed-time graph for 60 seconds for a car journey.



- (a) change 90 km/h to m/s. --- [2]
- (b) Find the deceleration of the car in m/s^2 . --- [1]
- (c) Find the distance travelled, in metres, in the 60 seconds. --- [2]

[S-18/23/Q24]

6. The diagram shows the speed-time graph for the first T seconds of a car journey.



- (a) Find the acceleration during the first 10 seconds. --- [1]
- (b) Total distance travelled during the T seconds is 480m, Find the value of T. --- [3]

[W-18/23/Q21]

1(a) These are the first four terms of a sequence. 5, 8, 11, 14. --- [1]

(i) Write down the next term.

(ii) Find an expression, in terms of n , for the n th term. --- [2]

(b) These are the first five terms of another sequence.

$$\frac{1}{2}, \frac{3}{4}, \frac{7}{6}, \frac{13}{8}, \frac{21}{10}$$

Find the next term.

[S-19/21/Q22] --- [1]

2. Here is a sequence,

$$a, 13, 9, 3, -5, -15, b, \dots$$

--- [2]

Find the value of a and the value of b .

[S-18/22/Q3]

3. Find an expression for the n th term of each sequence.

(a) 11, 7, 3, -1, ---

--- [2]

(b) 3, 6, 12, 24, ---

[S-18/23/Q22] --- [2]

4. These are the first five terms in a sequence.

$$8 \quad 11 \quad 14 \quad 17 \quad 20$$

(a) Find the next term.

--- [1]

(b) Find an expression for the n th term.

[W-18/21/Q11] --- [2]

5. These are the first five terms of a sequence.

$$-4, 2, 8, 14, 20$$

[W-18/22/Q3]

Find an expression for the n th term of this sequence. --- [2]

6. Here is a sequence of numbers.

$$7, 5, 3, 1, -1, \dots$$

(a) Find the next term in this sequence.

--- [1]

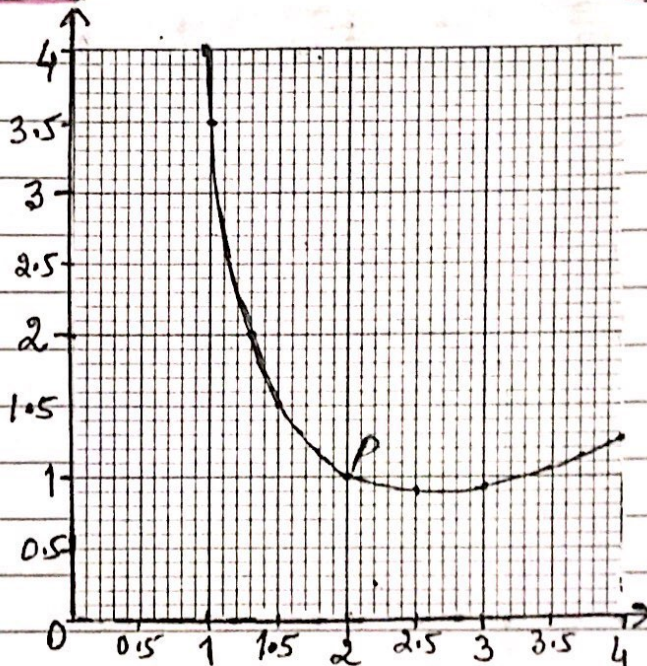
(b) Find an expression for the n th term of this sequence.

--- [2]

[SP-20/02/Q15]

Exercise - 7

1. By drawing a suitable tangent, estimate the gradient of the curve at the point P.



---[3]

M-19/22/Q16

2. $f(x) = 2x + 3$
find $f(1-x)$ in its simplest form.

S-19/21/Q10 [2]

3. $x^2 + 4x - 9 = (x+a)^2 + b$

find the value of a and the value of b.

S-19/21/Q13 [3]

4. $f(x) = 7 - x$ $g(x) = 4x + 2$ $h(x) = 75 - x^2$

(a) Find $ff(2)$

---[2]

(b) find $gf(x)$ in its simplest form.

---[2]

(c) find $h(2x)$ in its simplest form.

M-18/22/Q21 [2]

5. $f(x) = 5 - 2x$ $g(x) = x^2 + 8$

(a) Calculate $ff(-3)$

---[2]

(b) Find (i) $g(2x)$

---[1]

(ii) $f^{-1}(x)$

S-18/21/Q22 [2]

---[2]

6. $f(x) = 7 + 3x$ $g(x) = x^4$ $h(x) = 3^{2x}$

(a) $h(3x) = k^x$, find the value of k.

---[2]

(b) Find the value of x, when $f(x) = g(2)$

---[2]

(c) Find $f^{-1}(x)$.

---[2]

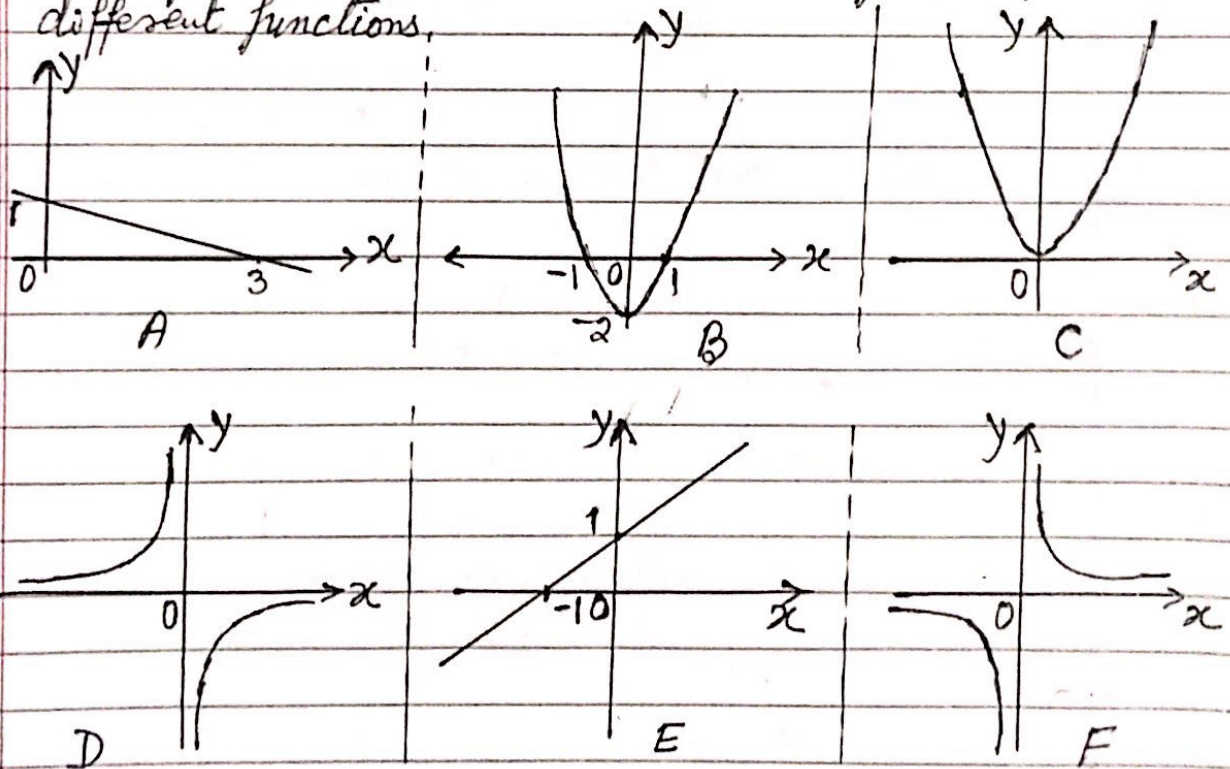
W-18/21/Q23

7. $x^2 - 12x + a = (x+b)^2$ ---[3]
Find the value of a and the value of b . [W-18/22/Q16]

8. (a) $f(x) = x^3$ $g(x) = 5x + 2$
(i) find $gf(x)$ ---[1]
(ii) find $g^{-1}(x)$ ---[2]

(b) $h(x) = ax^2 + 1$ ---[2]
find the value of a when $h(-2) = 21$. [W-18/22/Q25]

9. The diagrams A, B, C, D, E and F are six graphs of different functions.



Complete the table to identify the correct graph for each function. One has been done for you.

Function	$y = x + 1$	$y = 1 - x/3$	$y = 2x^2$	$y = -4/x$
Diagram	E			

[SP-2020/02/Q21] ---[3]

10. Find the turning point of $y = x^2 + 4x - 3$,
by completing the square. [SP-20/02/Q25] ---[4]

Exercise 1

Answers

1. (a) $K(7K - 15)$

(b) $4(m+p)(3+2m+2p)$

2. $\frac{b}{a+b}$

3. $y(5-6p)$

4. $3x^2 - 3x + 2$

5 (a) $(p-q)(p+q)$

(b) $\frac{7}{2}$

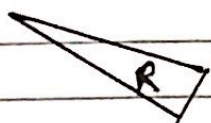
6. $\frac{x-5}{(x+2)(3x-1)}$

7. 2.

8. $x = -4$ and $y = 3$

9 (a)

(b) 7



10. $\frac{3x^2 - 4x + 9}{(x+3)(x-5)}$

11. $m = \frac{k}{p-1}$

12. -1.52 ; 2.19

13. $x(2x-1)$

14. $w = \frac{p}{2} - h$ or $\frac{p-2h}{2}$

15. $2m+1$

16. (a) 3 (b) -7

17. $\frac{x^2}{x-5}$

18. $5m(3k^2 - 4m^3)$

19. $x = 7$; $y = -2$

20. 0.39 ; -3.89

21. 66

22. $7y-23$

23. $n < -4.4$ or $n < -4\frac{2}{5}$

24. $7x-56$

25 (a) $w = 7$ (b) $12x = 36$

26. $(x+2)(y+3)$

27. $w(1+w^2)$

28. -11

29. $(a+2b)(2-x)$

30. $x = \pm \sqrt{\frac{A}{2\pi + y}}$

31. $\frac{1}{3-x}$

32. $6p^2 + 5p - 6$

33. $\frac{1}{y(y-1)}$ or $\frac{1}{y^2 - y}$

34. $6x^2 + 13x - 63$

35. 4, 5, 6

36. $\frac{x^2 - 3x + 8}{3(x+2)}$

37. $x = 6$; $y = -8$

38. -3.41 ; 1.08

39. $6x - 2x^3$

40. $m \geq 3$

41. $(x+5)(y+2)$

42. $\frac{2x}{3+x}$

43. $y(1-2y)$

44. $-3p-4q$

45. 13

46. $\frac{A - \pi r^2}{\pi r}$

47. $\frac{1}{x(x+1)}$

48. -0.55 ; 1.22

49. $\frac{x-1}{x}$

Exercise 1 (Continued) / Answers

Ex-3 (cont.)

50(a) $(x+y)(p-1)$
(b) $2(t+9m)(t-9m)$

51. 11

52. $\frac{3y-7}{5}$

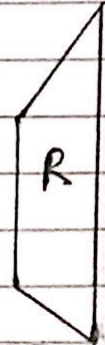
53. $n > 3.75$

54. $\begin{cases} x=2 \\ y=9 \end{cases}$; $\begin{cases} x=-2 \\ y=-7 \end{cases}$

3. $y \geq 1.5$; $y \geq \frac{3}{4}x$,
 $y < -\frac{1}{2}x + 3$

4. $y > 2$; $y \geq 3-x$

5.



Exercise - 2

1. (a) t^{14}
(b) u^{25}

2. (a) $27y^{12}$
(b) $\frac{5}{2}$

3. (a) $10m^5$
(b) x^{24}

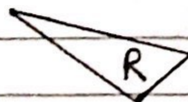
4. (a) 8
(b) (i) $\frac{x^2}{76}$ (ii) $a^{-3}b^5$
or $\frac{b^5}{a^3}$

5. (a) $\frac{1}{w}$ or w^{-1}
(b) $27w^9$

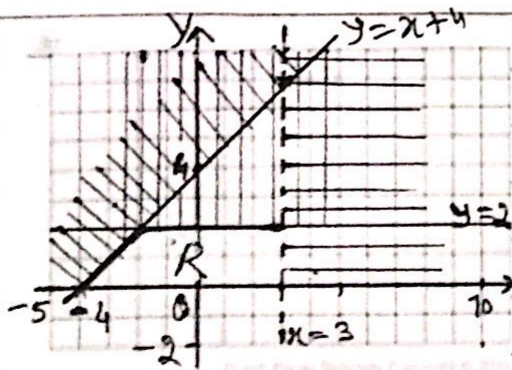
6. (a) $3x^2$ (b) 32

Exercise - 3

1. (a)
(b) 7



2.



Exercise - 4

1. $y = \frac{1}{4}(x-4)$

2. ± 0.6

3. 0.14

4. 12

5. 9

6. (a) $d = 4.9t^2$

(b) 19.6

7. 150

8. $y = \frac{4}{x^3}$

9. 10

Exercise - 5

1. (a) $1\frac{2}{3}$ or 1.67 (b) 1062.5

2. (a) 2 (b) 1300

3. (a) 2200 (b) 16.92

4. 30

5. (a) 25 (b) 1.25 (c) 1250

6. (a) 1.2 (b) 45

Exercise-6Answers

1(a)(i) 17 (ii) $3n+2$

(b) $\frac{31}{12}$

2. $a=15$; $b=-27$

3. (a) $15-4n$ (b) $3 \times 2^{n-1}$

4. (a) 23 (b) $3n+5$

5. $6n-10$

6 (a) -3 (b) $9-2n$

Exercise-7

1. tangent ruled at $x=2$,
 -0.7 to -0.3

2. $5-2x$

3. $a=2$; $b=-13$

4. (a) 2

(b) $30-4x$ (c) $15-4x^2$

5. (a) -17

(b) (i) $4x^2+8$ (ii) $\frac{5-x}{2}$

6. (a) 27 (b) 3 (c) $\frac{x-7}{3}$

7. $a=36$, $b=-6$

8. (a) (i) $5x^3+2$ (ii) $\frac{x-2}{5}$

(b) 5

9. A, C, D.

10. $(x+2)^2-7$

Turning point $(-2, -7)$.