



Preface

The administration of Somaliland national examination and certification board (SLNECB) authorized the compilation, production and publication of Somaliland national maths paper 1 examination books with simplified answers and solutions for secondary students. The production of these books came after a success through great and selfless effort, made by SLNECB and the teacher who compiled it. This was necessitated by the tremendous needs of the whole Somaliland secondary students in order that they get equal rights and experience in performing national examinations in particular and the international examinations in general.

I hope all Somaliland students and teachers will enjoy using these valuable books.



Daud Ahmed Farah

Chairman of Somaliland national
examination and certification board

Republic of Somaliland

SLNECB

Maths Paper 1 Examinations
With simplified answers

First edition 2014

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Chapter 1: Algebra

1.1. Multiple choices:

1. I start with x , then square it, multiply by 3 and finally subtract 4.

The final result is

A	$(3x)^2 - 4$	B	$(3x - 4)^2$
C	$3x^2 - 4$	D	$3(x - 4)^2$

2. Given that $\frac{2x}{5} - \frac{(x-1)}{3} = \frac{11}{15}$, then x is

- A. 6
- B. 10
- C. 12
- D. 16

3. The exact value of $4\frac{4}{5} \times 8\frac{1}{3} \div \frac{1}{2}$ is

- A. 80
- B. $64\frac{8}{15}$
- C. 20
- D. $16\frac{2}{15}$

4. Given that $h = \frac{k(1-p)}{2p+1}$, then making p the subject,

A. $p = \frac{k(1-p) - h}{2h}$

B. $p = \frac{k-h}{2h+k}$

C. $p = \frac{k}{2h+k}$

D. $p = \frac{k+h}{2p-k}$

5. $(3y - 2)(2y+3)$ is the same as

A. $6y^2 + 5y - 6$

B. $5y^2 + 5y + 1$

C. $6y^2 - 13y - 6$

D. $5y^2 - 13y + 1$

6. $\frac{1}{3} + \frac{2}{5} =$

A. $\frac{2}{8}$

B. $\frac{3}{8}$

C. $\frac{3}{15}$

D. $\frac{11}{15}$

7. $\sqrt{\left(\frac{m}{x}\right)} = a$, $x =$

A. a^2m

B. $a - m$

C. $\frac{m}{a^2}$

D. $\frac{a^2}{m}$

8. the equation $ax^2 + x - 6 = 0$ has the solution $x = -2$ what is a ?
- A. 2
 - B. -2
 - C. $\sqrt{2}$
 - D. 1
9. How many prime numbers are there between 30 and 40?
- A. 0
 - B. 1
 - C. 2
 - D. 3
10. Work out $24 \div 8 + 4 \times 5 - 2$
- A. 8
 - B. 21
 - C. 4
 - D. 48
11. The solutions of $2x+3y=7$ and $3x+2y=8$ are
- A. 2, 1
 - B. 4, 2
 - C. 6, 3
 - D. 1, 3
12. The solutions for the equation $x^2 - 2x = 15$ are
- A. (-5, 3)
 - B. (-3, 5)
 - C. -15
 - D. (-5, 0)

13. Simplify: $\frac{x + \frac{1}{2}}{4x + 2}$
- A. $\frac{2}{4}$
- B. $\frac{2x+1}{4x+2}$
- C. $\frac{1}{4}$
- D. $\frac{1}{2}$
14. The factors of $f(x) = 5x^2 - 20$ are
- A. $5(x + 2)(x - 2)$
- B. $5(x^2 - 20)$
- C. $5(x^2 - 10)$
- D. $5(x - 2)^2$.
15. The sum of 4 consecutive numbers is 38. What are the numbers.
- A. 11,10,9,8
- B. 9,7,12,10
- C. 14,10,8,6
- D. 7,9,10,12.
16. The coefficient of "X" in the expansion of $(x + 3)(x - 1)$ is:
- A. 2
- B. 4
- C. -1
- D. 3.

17. If $m = \sqrt{2}$ and $n = \sqrt{8}$, what is the value of $(m + n)^2$?
- A. 54
 - B. 36
 - C. 18
 - D. 9.
18. Solving $28 - 4n = 56$, hence, what is the value of n ?
- A. 7
 - B. -7
 - C. 14
 - D. -14 .
19. The value of x in the equation $2x + 4 = 6$ is
- A. 1
 - B. 2
 - C. 5
 - D. 10
20. One of the factors of $25x^2 + 5x - 2$ is:
- A. $5x - 2$
 - B. $2x - 1$
 - C. $5x + 1$
 - D. $5x - 1$
21. Simplifying $3 + 7(2x - 5)$ is
- A. $14x - 31$
 - B. $-14x + 32$
 - C. $14x - 32$
 - D. $14x + 32$

22. making x the subject of the equation $2\sqrt{x} = a$, x will be equal to:

A. $\frac{a^2}{2}$
B. $\frac{a^2}{4}$
C. $\sqrt{a}$
D. $4a^2$

23. The value of $2x^2 - 3y$ when $x = 3$ and $y = 2$ is:

A. 14
B. -14
C. -12
D. 12

24. The solution of $\frac{2}{3}x + 6 = 10$:

A. 6
B. 10
C. 18
D. 24

25. If x is an integer, for what set of values is $4 - 2x > x - 5$

A. $x > 3$
B. $-x < -3$
C. $x < 3$
D. $x > -3$

26. What value of x makes the equation below true?

$$\frac{x}{9} + 6 = 8$$

- A. 2
- B. 18
- C. 66
- D. 126

27. The solution set of $x^2 - 5x - 24 = 0$ is

- A. $\{8, -3\}$
- B. $\{5, -3\}$
- C. $\{-3, 8, \}$
- D. $\{4, 6\}$

28. If $a = 3$ and $b = -2$, what is the value of

$$a^2 + 3ab - b^2$$

- A. 5
- B. -5
- C. 13
- D. -13

29. Factor the expression: $x^2 + x - 12$.

- A. $(x - 4)(x + 4)$
- B. $(x - 2)(x + 6)$
- C. $(x + 4)(x - 3)$
- D. $(x - 4)(x + 3)$

30. The value of $\frac{51.92 \times 202}{4.93}$ is closest to
- A. 20.
 - B. 200.
 - C. 2,000.
 - D. 20,000.
31. If $-3xy = 45$, which of the following statements is true?
- A. Only x is negative
 - B. Only y is negative
 - C. Both x and y are negative
 - D. Either x or y is negative.
32. Compute: $10 - (3)^2 + (-3) \times 2$
- A. -5
 - B. 4
 - C. -2
 - D. 2
33. If the expression $x^2 - kx - 12$ is equal to zero when $x = 4$, what is the value of k ?
- A. 7
 - B. 1
 - C. -1
 - D. -3
34. If $x + 2y = 1$, and $2x + y = 5$, then $x + y = ?$
- A. 2
 - B. 3
 - C. 4
 - D. 5

35. The solution to the following pair of simultaneous

equations is: $9x - 4y = -14$

$4x - 9y = 1$

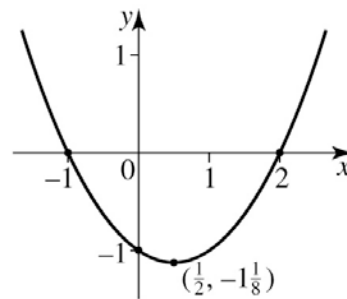
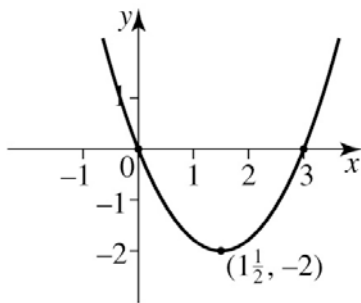
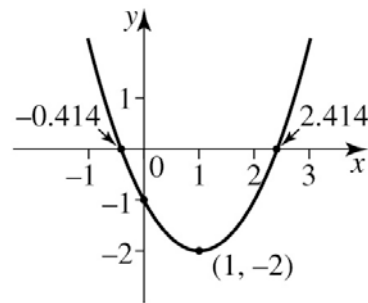
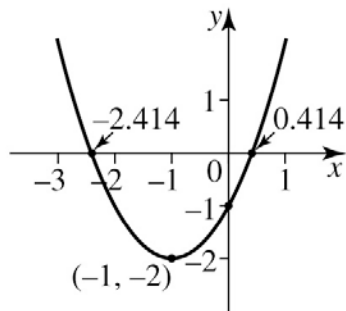
A. $(-2, -1)$

B. $(2, 1)$

C. $(1, 2)$

D. $(-1, -2)$

36. The graph which best represents $y = x^2 - 2x - 1$ is:



37. Solution of the equation $\frac{3x}{4} = 2$ is

A. $\frac{3}{8}$

B. 8

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

D. 3

38. The solution to the following pair of simultaneous equations is:

$$3x - y = 18$$

$$4x + y = 10$$

A. (5, -3)

B. (-3, 5)

C. (4, -6)

D. (4, 6)

39. When factorized $36j - 48$ becomes:

A. $12(3j - 4)$

B. $12(24j - 36)$

C. $9(4j - 7)$

D. $8(4j - 6)$

40. When simplified $\frac{2x}{5} + \frac{x}{2}$ becomes:
- A. $\frac{3x}{7}$
- B. $\frac{3x}{10}$
- C. $\frac{9x}{7}$
- D. $\frac{9x}{10}$
41. What is the slope of the line $5y = -3x + 10$?
- A. -3
- B. $-\frac{3}{5}$
- C. $\frac{5}{3}$
- D. 2
42. The value of $23.1 + 0.231 + 6.32$ is
- A. 2.9651
- B. 96.531
- C. 7.782
- D. 29.651
43. Each band member had 12 tickets to sell to the spring concert.
- Jama sold $\frac{2}{3}$ of his tickets.
 - Kule sold $\frac{1}{2}$ of hers.
 - Mohamed sold $\frac{3}{4}$ of his.
 - Suad sold $\frac{7}{12}$ of hers.

Who sold the most tickets?

- A. Jama
- B. Kule
- C. Mohamed
- D. Suad

44. Solve for x , $\frac{x-9}{5} = 5$

- A. $x = 45$
- B. $x = 25$
- C. $x = 9$
- D. $x = 34$

45. Solving $2(3a - 7) + 5(1 - 2a) = 2(a + 6) + 3(1 - 3a)$ yields:

- A. 4
- B. 6
- C. 7
- D. 8

46. Solving $28 - 4n = 56$ yields:

- A. -7
- B. 7
- C. -4
- D. 4

47. Solve for x : $\frac{3}{5}(x + 2) = x - 4$

- A. 8
- B. 15
- C. 13
- D. 23

48. The solutions to the equation $x^2 - 6x + 5 = 0$ are:

- A. $x = 1$ and $x = 5$
- B. $x = 1$ and $x = -5$
- C. $x = -1$ and $x = 5$
- D. $x = -1$ and $x = -5$

49. If $\sqrt{x-4} = 7$, what is the value of x ?

- A. 11
- B. 45
- C. 18
- D. 53

50. What is the x-intercept of the line defined by $-2x+3y=12$?

- A. 6
- B. 4
- C. -4
- D. -6

51. If $e = 3\frac{1}{3}$ and $f = 4\frac{3}{4}$ then $5e - 3f$ equals:

- A. $2\frac{7}{12}$
- B. $3\frac{1}{12}$
- C. $2\frac{5}{12}$
- D. $2\frac{1}{12}$

52.

$$(3y - 1)^4 =$$

A $81y^4 - 108y^3 + 54y^2 - 12y + 1$

B $81y^4 + 108y^3 - 54y^2 - 12y + 1$

C $81y^4 - 54y^3 - 108y^2 - 12y + 1$

D $81y^4 + 54y^3 - 108y^2 - 12y + 1$

53. If $3ax+b=c$, then x equals

A. $c - b + 3a$

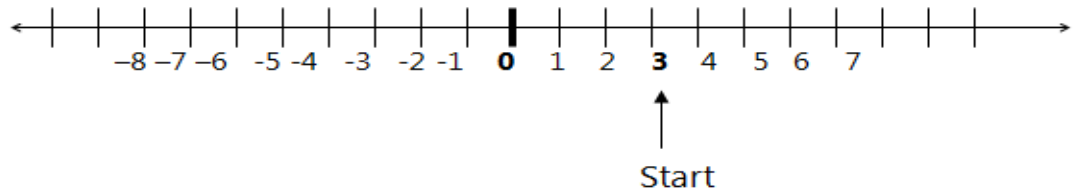
B. $\frac{c-b}{3a}$

C. $c + b - 3a$

D. $\frac{b-c}{3a}$

1.2. Structured questions

1. Simplify : $3 - 9 + 14$ with the help of this number line.



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2. Factorize: $3x^2 + 10x + 3$

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3. Solve :

$$\frac{4x - 1}{3} - \frac{2x - 3}{2} = 1$$

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4. I think of a number and multiply it by 5. Then I add 15 and the result is 100. Let the number be x and so find the number I thought of

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5.

- a) A man is now five times as old as his son. In five years time he will be three times as old as his son. Find their present ages.

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- b) Solve the quadratic $5x^2 + x - 4 = 0$

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6. Solve the simultaneous equations $3x + 2y = 13$

$$5x - 3y = 9$$

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7. Solve for x in the equation: $\frac{6x-4}{3} - \frac{2x-1}{2} = \frac{6-5x}{6}$

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8. Aysha received X marks in test, Zahra received 4 more marks than aysha.

a)

i) Write down zahra's marks in terms of X

i.

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- ii. When aysha subtracts 7 from her marks and squares the result, her answer is 1 more than Zahra's mark. write down an equation in X, show that it simplifies to $X^2 - 15X + 44 = 0$

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- b) Solve the equation $X^2 - 15X + 44 = 0$

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9. Solve each of the following x

a) $3(x - 1) = 18$

b) $x : 12 = 6 : 8$

c) $2^x = 16$

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10. Solve algebraically $2x - 5y = 24$
 $7x + 8y = 24$

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11. Change the subject of the formula $P = 2(L + B)$ to L

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12. Evaluate $\left(3\frac{4}{5} - 2\frac{3}{4}\right) \times 1\frac{2}{3}$

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13. Evaluate $\left(\frac{4}{3}\right)^{-2}$

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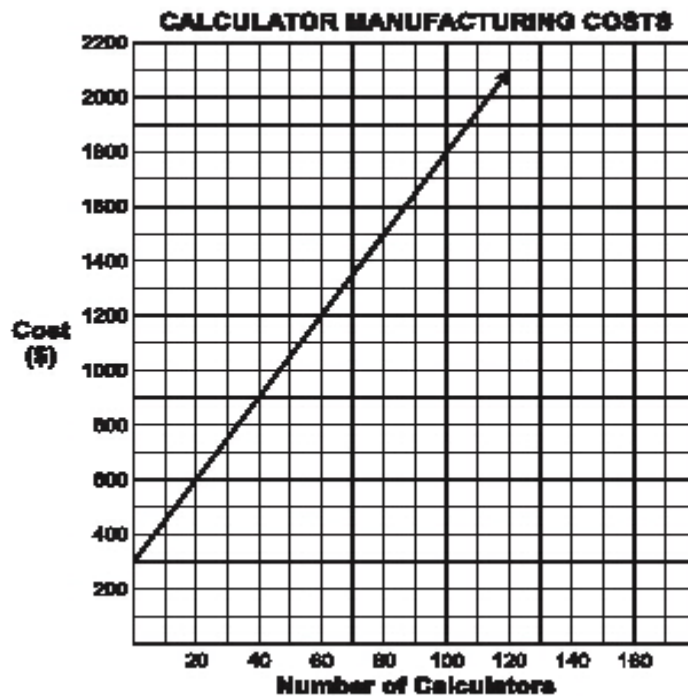
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14. The graph below models the cost of manufacturing calculators.



Derive an equation that shows the relationship between the number of calculators, n and the total cost, C ?

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15. A formula was given as $S = \frac{p+q}{p}$. Rearrange the formula
to make p the subject

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16. Solve for x in each of the following

$$2(x - 1) = 6$$

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17. Solve the equations

i) $3y+7=28$

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ii) $2(3p+2)=19$

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18. Solve the quadratic $6x^2 + 13x - 5 = 0$

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19. Make h the subject of the formula $D = \sqrt{\frac{3h}{2}}$

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20. Solve the simultaneous equations $\begin{matrix} 4x + y = 5 \\ 2x - 3y = 13 \end{matrix}$

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21. Factorize the expression $x^2 + x - 12$

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22. Solve for x: $\frac{2x}{5} + \frac{1}{3} = \frac{7x-2}{15}$?

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23. Simplify $\frac{25x-125}{x^2-25}$

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Chapter 2: Functions

2.1. Multiple choices

1. If $f(x) = 3x + 1$ and $g(x) = 1 / 3x$ then $fg (1/2)$ equals

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

B. $1/6$

C. $3\frac{1}{2}$

D. 3

2. If $f(x) = \frac{x+1}{3}$, then $f^{-1}(3)$ equals

A	6	B	7
C	8	D	9

3. $f(x) = x^2 - x + c$ and $f(6) = 18$, then $f(-4)$ is

A. 8

B. - 2

C. - 6

D. - 32.

4. If $f(x) = x^2 - 3$, then $f(3) - f(-1)$ is

A. 8

B. 10

C. 5

D. 9

5. If $f(x) = 3x^2 - 2x$ find out $f(-2)$

- A. 16
- B. 12
- C. -8
- D. -16.

6. If $f(x) = \frac{1-x}{x}$, find $f^{-1}(0)$?

- A. $\frac{1}{2}$
- B. 1
- C. 0
- D. -1.

7. $f(x) = 3x + 5$ and $g(x) = 2x - 1$ so $f(g(2))$ is

- A. 11
- B. 3
- C. 21
- D. 14

8. Given that $f(x) = 3x^2 - 4$ and $g(x) = 2x - 6$, what is $g(f(2))$?

- A. -2
- B. 6
- C. 8
- D. 10

9. If $f(x)=3x+2$, then $f^{-1}(3)$ is

A. 11

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

C. $\frac{1}{3}$

D. 1

10. What is the inverse of the function $y = 3x - 2$?

A. $y = -3x + 2$

B. $y = \frac{x-2}{3}$

C. $y = \frac{x+2}{3}$

D. $3y = 2x$

2.2. Structured questions

1. Show that $f\{g(x)\} = g\{f(x)\}$, when $f(x) = \frac{3x - 1}{2}$

and $g(x) = \frac{2x + 1}{3}$

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2. $f(x) = 3 - 2x$ and $g(x) = \frac{x+1}{4}$

a) Find the value of $f(-3/4)$

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b) Find the value of $g(-1)$

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

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d) find the composite function $fg(x)$

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e) find the composite function $gf(x)$

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3. Given $f(x) = \frac{4x+3}{2}$, find the inverse function $f^{-1}(x)$

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4. Given $f(x) = 3x^2 + 5x$ and $g(x) = 2x - 5$. calculate

a. $f(g(x))$

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b. $f(g(2))$

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c. $g(f(x))$

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d. $g(f(-1))$

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5. Given that $f(x) = x^2 + 3$

a. Evaluate $f(-4)$

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b. Find x when $f(x) = 54$

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Chapter 3: Inequality

3.1. Multiple choices

1. Solve the inequality $=4x - 4 < 20$.

- A. $x < 4$
- B. $x > 4$
- C. $x < 6$
- D. > 6

2. Muna tried to solve the inequality $13 - 3p < 6$. Here is her solution. She has made one mistake.

$13 - 3p < 6$

- i) $-3p < 6 - 13$ Line A
- ii) $-3p < -7$ Line B
- iii) $\frac{-3p}{-3} < \frac{-7}{-3}$ Line C
- iv) $P < \frac{7}{3}$ Line D

Which line does NOT follow correctly from the previous line?

- A. Line A
- B. Line B
- C. Line C
- D. Line D

3. Solve the inequality $1 - 3x \geq 7$

- A. $x \geq -2$
- B. $x \leq -2$
- C. $-3x \leq 6$
- D. $-x \geq -2$.

4. If $3x - 6 \leq 18$, what is the value of $x - 2$?

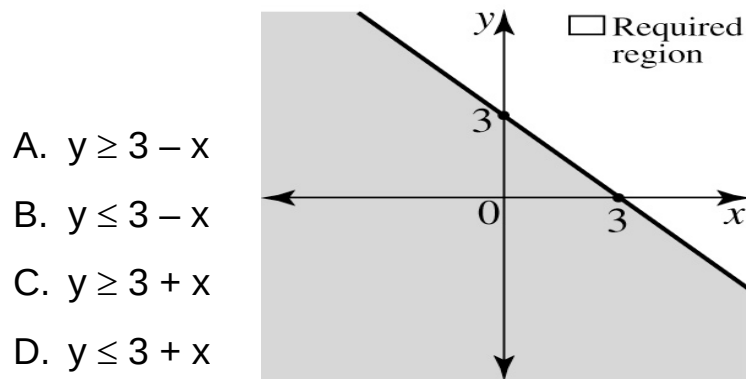
- A. 9
- B. 8
- C. 6
- D. 3

5. The number line given shows the solution of the inequality:



- A. $-2y - 4 \leq 8$
- B. $-3y - 4 \leq 8$
- C. $-5y + 8 \leq 10$
- D. $3y - 4 \leq 8$

6. Which of the following inequalities represents the shaded region in the given figure?



- A. $y \geq 3 - x$
- B. $y \leq 3 - x$
- C. $y \geq 3 + x$
- D. $y \leq 3 + x$

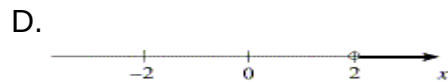
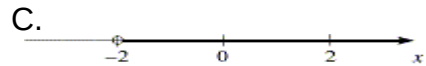
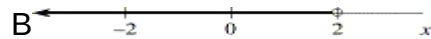
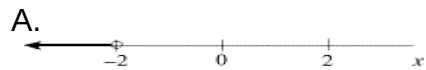
7. The solution to $8q - 7 > -15$ is:

- A. $q > -1$
- B. $q < -1$
- C. $q < -2$
- D. $q < 2$

8. The range of values for which $7 < 3x + 1 \leq 13$ is

- A. $3 < x < 4$
- B. $2 < x \leq 13$
- C. $7 < x < 4$
- D. $2 < x \leq 4$

9. Which of the following is the graph of the solution set of $-2x > 4$?



3.2. Structured questions

1. (A) Find the solution of the inequality $13 \leq 2x + 5 \leq 19$,
and illustrate the solution on a number line.

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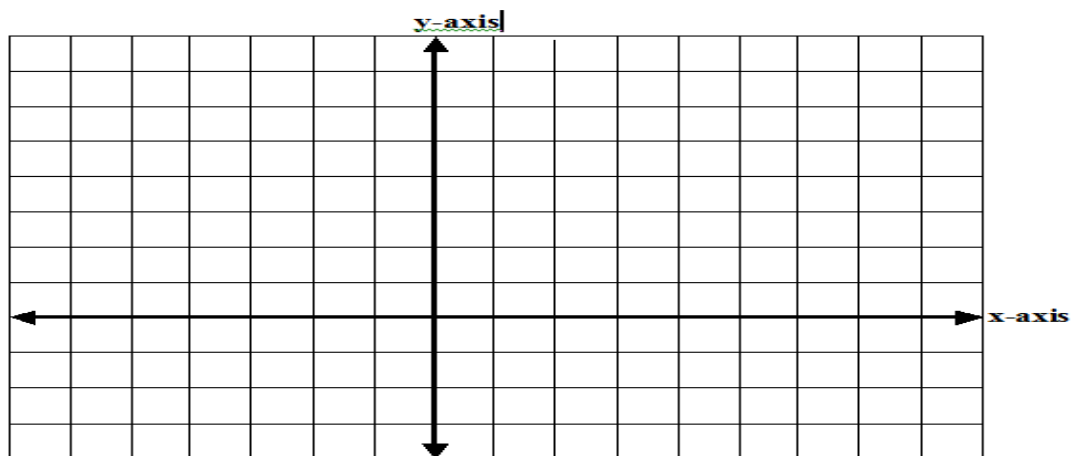
2. Shade the required region enclosed by $y > 1$, $2x - 3y \leq 5$ and $x < 6$.

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3. Solve the inequality $\frac{2x}{3} + 2 \leq \frac{5x}{2} - 9$

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4. Solve the inequality $4x - 2 < -2x + 10$

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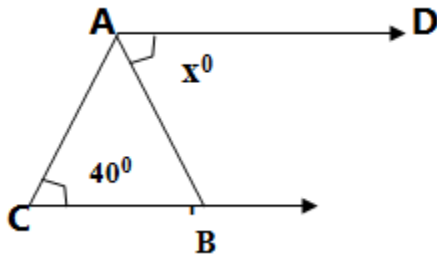
Chapter 4: Plane geometry

4.1. Multiple choices

1. A trapezium of area 105cm^2 has a parallel sided of length 5cm and 9cm . how far apart are the parallel sides

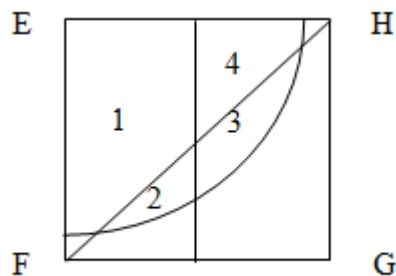
- A. 15cm
- B. 12cm
- C. 21
- D. 10cm

2. AD and CE are parallel, $\overrightarrow{AC} = \overrightarrow{CB}$. Find X.



- A. 40°
- B. 50°
- C. 70°
- D. 110°

3. A point P lies inside a square EFGH of side 4 cm . P is



- within 3.5 cm of E,
- nearer to HG than to EF,
- nearer to E than to G.

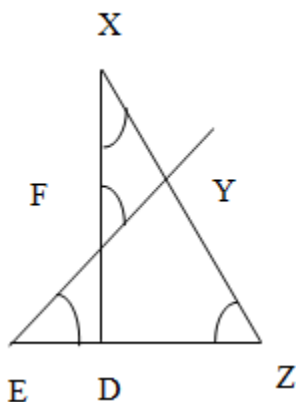
Then P lies in region

- A. 1
- B. 2
- C. 3
- D. 4

4. The sum of degrees of interior angles of a regular octagon is:

- A. 360°
- B. 540°
- C. 720°
- D. 1080°

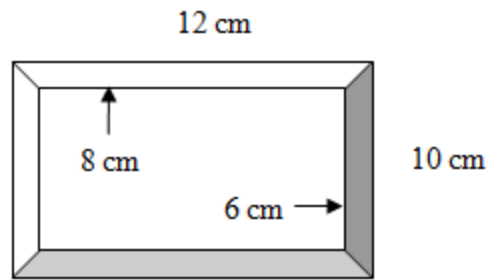
5.



In the figure, $\angle ZXD = 50^\circ$
 $\angle XFY = 20^\circ$, $\angle ZEY = 70^\circ$
 and $\angle YZE = x$. the value
 of x is

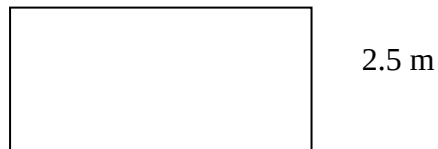
- A 20° B 30°
- C 40° D 60°

6.



This wooden frame is cut from a 2 meters length of wood 2 cm by 1 cm. The minimum length of wood which must be used is

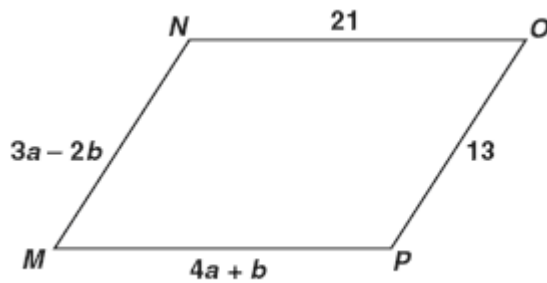
- A. 28 cm
 - B. 36 cm
 - C. 44 cm
 - D. 48 cm
7. The rectangle shown below has a width of 2.5 m and a perimeter of 13 m.



What is the area of the rectangle?

- A. 4 m^2
- B. 8 m^2
- C. 10 m^2
- D. 10.5 m^2

8. What values of a and b make quadrilateral MNOP a parallelogram?



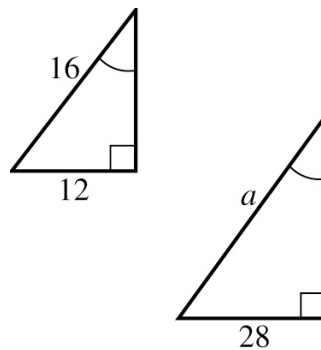
A. $a = 1, b = 5$

B. $a = 5, b = 1$

C. $a = \frac{11}{7}, b = \frac{34}{7}$

D. $a = \frac{34}{7}, b = \frac{11}{7}$

9. The value of the pronumeral in the pair of similar triangles in the figure below is:



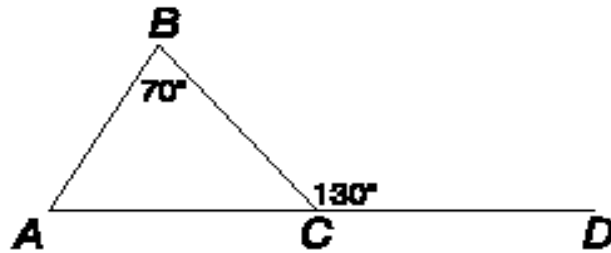
A. 36

B. 32

C. 35

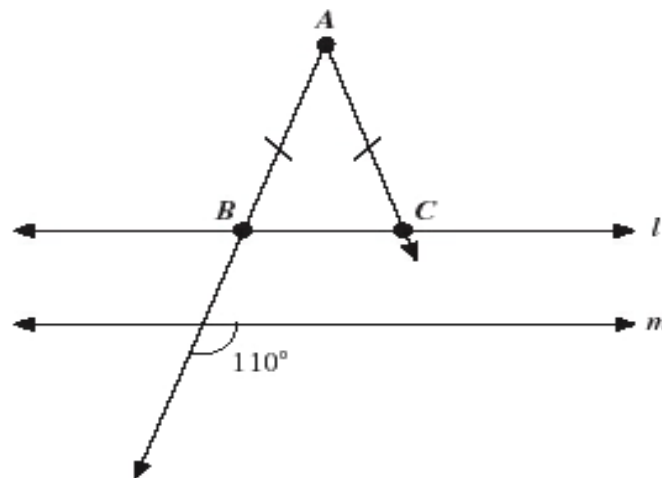
D. $37\frac{1}{3}$

10. What is the measure of angle A in the given figure?



- A. 60°
- B. 120°
- C. 50°
- D. 30°

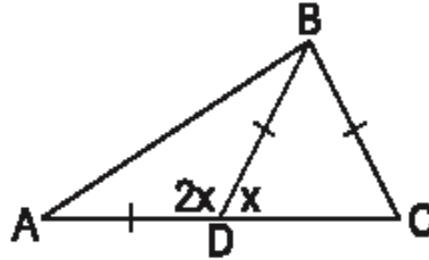
11. In the figure shown on the right, lines l and m are parallel, and triangle ABC is isosceles. What is the measure of angle ABC ?



- A. 40°
- B. 50°
- C. 60°
- D. 70°

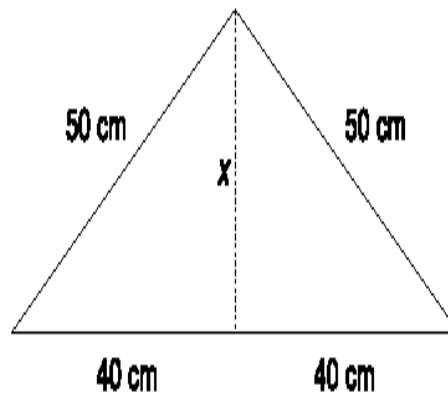
12. If $AD = BD = BC$ and the measure of angle ADB is twice the measure of angle BDC , what is the measure of angle ABC ?

- A. 70°
B. 80°
C. 90°
D. 100°

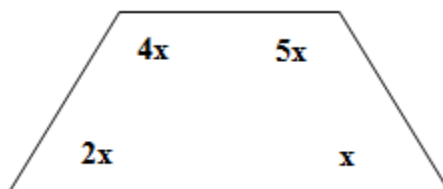


13. What is the length x of the altitude of the triangle shown below?

- A. 20 cm
B. 25 cm
C. 30 cm
D. 40 cm

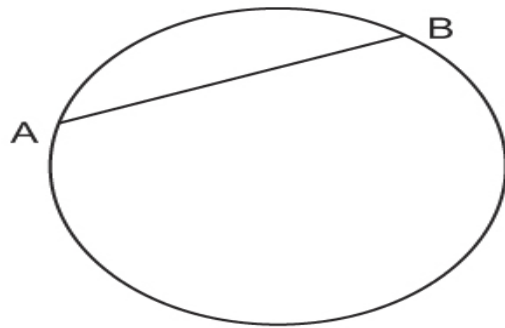


14. In the trapezium, the size of the angle x is



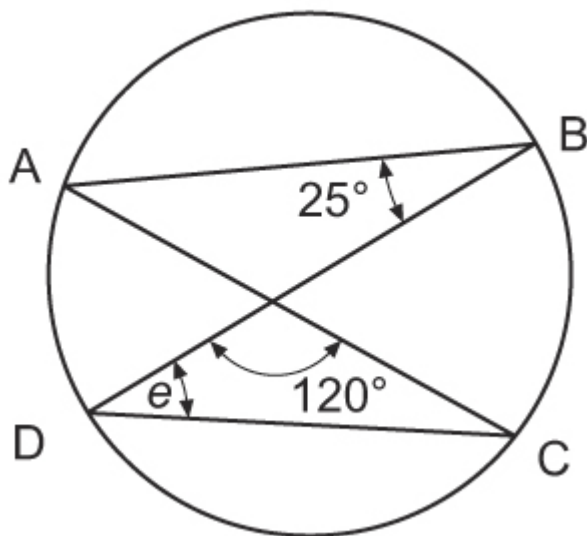
- A. 45
- B. 30
- C. 20
- D. 15

15. What is the mathematical name given to the line AB?



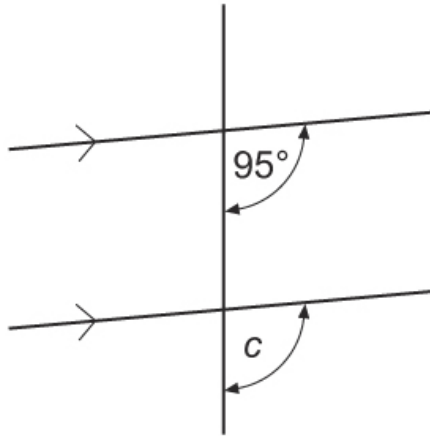
- A. radius
- B. chord
- C. diameter
- D. arc

16. From the diagram calculates the angle e.

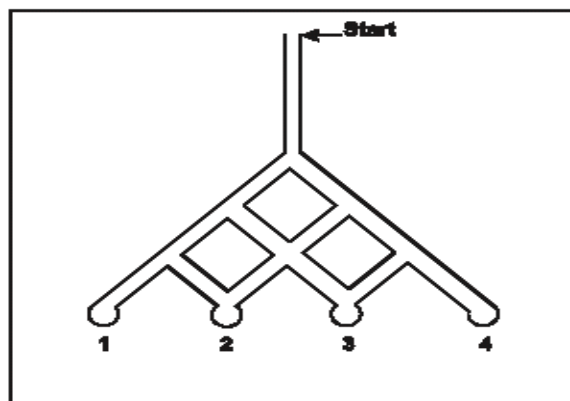


- A. 25°
- B. 35°
- C. 60°
- D. 30°

17. Calculate the size of the angle marked c and give a reason for your answer



- A. 95° as vertically opposite angles add up to 180° .
B. 85° as the angles are corresponding angles.
C. 95° as the angles are corresponding angles.
D. 85° as alternate angles add up to 180° .
18. Layla made the game board shown below. Small marbles start at the top and always roll down the marked paths until they land in one of the circles at the bottom.



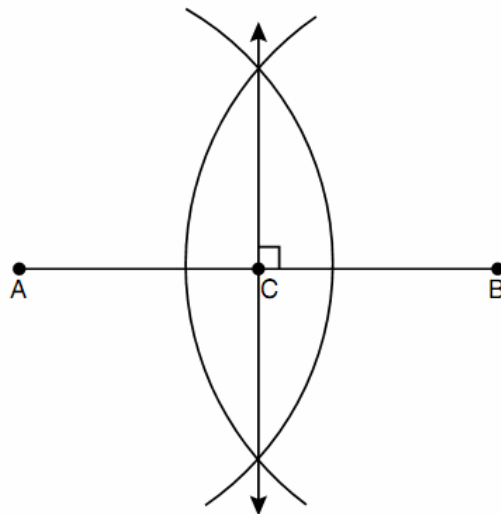
How many different paths can a marble take to land in Circle 2?

- A. 2
- B. 3
- C. 4
- D. 6

19. What is the value of x in the given triangle?

- A. 20
- B. 10
- C. 30
- D. 6.7

20. The diagram below shows the construction of the perpendicular bisector of $\overline{AB}$.



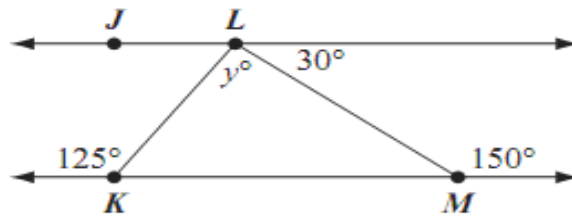
Which statement is NOT true?

- A. $AC=CB$
- B. $AC=2AB$

C. $CB = \frac{1}{2}AB$

D. $AC+CB=AB$

21. In the diagram below, $\overrightarrow{JL} = \overrightarrow{KM}$.



Based on the angle measures in the diagram, what is the value of y ?

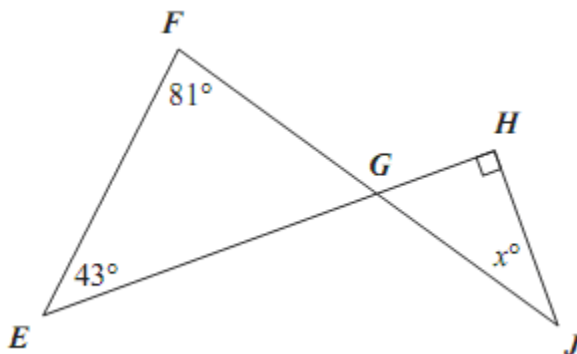
A. 75

B. 90

C. 95

D. 120

22. In the diagram below, $\overline{EH}$ intersects $\overline{FJ}$ at point G.



Based on the angle measures in the diagram, what is the value of x ?

A. 34

B. 38

C. 43

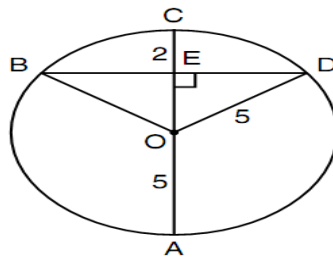
D. 56

23. What is the measure of an interior angle of a regular octagon

- A. 45°
- B. 60°
- C. 120°
- D. 135°

24. In the diagram below, circle O has a radius of 5, and $CE = 2$.

Diameter $\overline{AC}$ is perpendicular to chord $\overline{BD}$ at E.

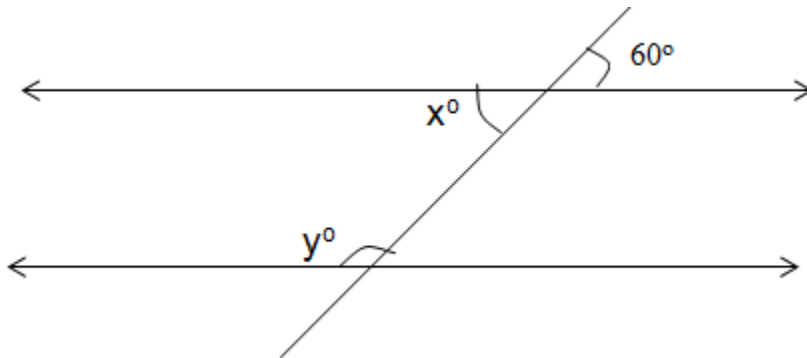


What is the length of $\overline{BD}$?

- A. 12
- B. 10
- C. 8
- D. 4

4.2. Structured questions

1. Find the marked angles “ x and y ”



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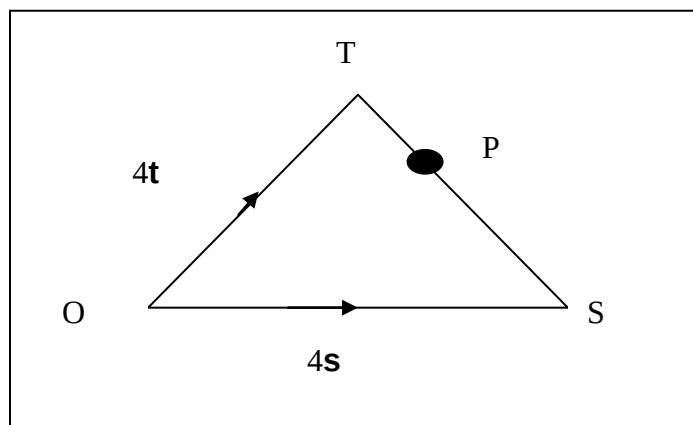
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2. In the diagram, $\vec{OS} = 4s$, $\vec{OT} = 4t$ and P is the point on ST such that $\vec{TP} = \frac{1}{3}\vec{TS}$.



Express in terms of s and t,

a) $\overrightarrow{ST}$

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b) $\overrightarrow{SP}$

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c) $\overrightarrow{OP}$.

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3. The interior angle of regular polygon is 48° more than the interior angle of a regular hexagon?

a) Find the size of the interior angle of the polygon?

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b) Find the number of sides?

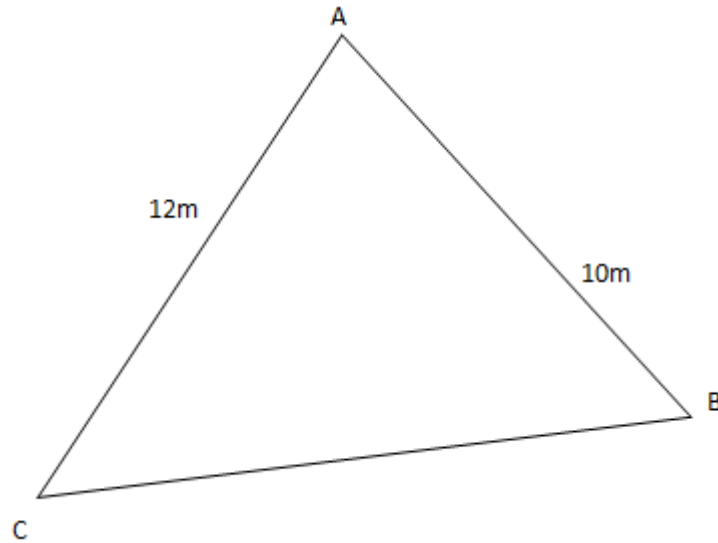
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4. A mason on the top o roof at A measures sides $AB=10\text{m}$ and $AC=12\text{m}$. And angle A as 60° .



- a) Calculate BC

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- b) If angle A is decreased to 45° , what is the decrease in BC?

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5. The length of a classroom is 3m longer than its breadth. If its area is 270 m^2 , find the dimensions of the room.

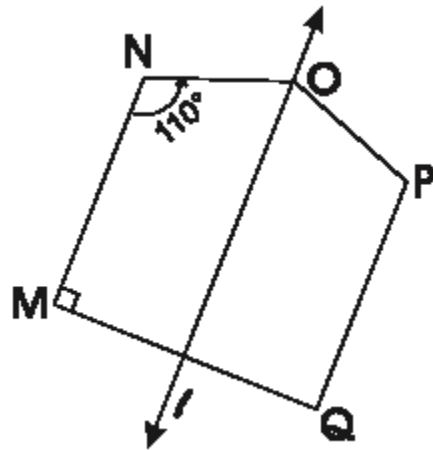
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6. The line l is a line of symmetry for figure MNOPQ. What is the measure of angle NOP?



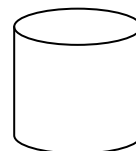
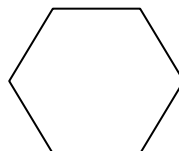
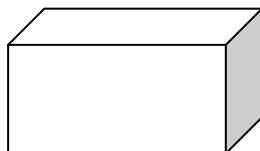
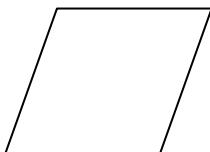
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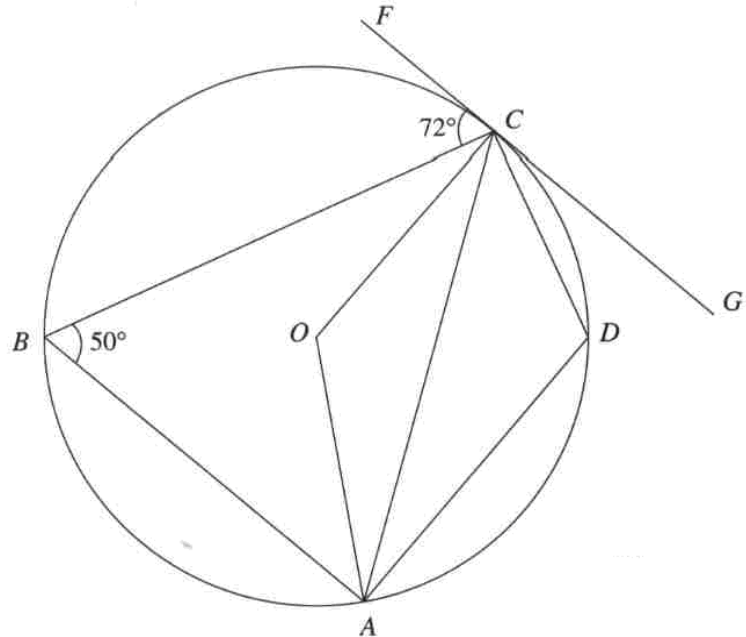
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7. Write down the special names of the following shapes



8. A, B, C and D are four points on the circumference of a circle centre O. the tangent FG meets the circle at C. Angle BCF 72° and angle ABC = 50° .



Find each of the following angles

- a. Angle AOC

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- b. Angle ADC

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- c. Angle BAC

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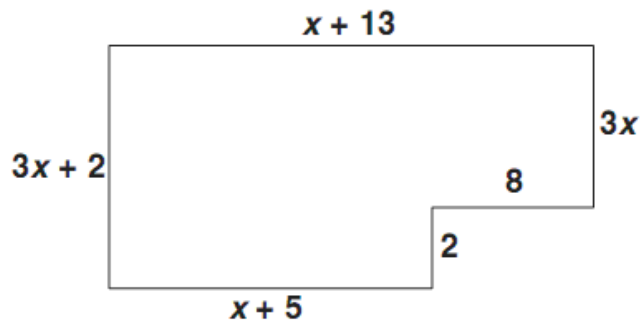
d. Angle OAB

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9. What is the perimeter of the figure shown below?

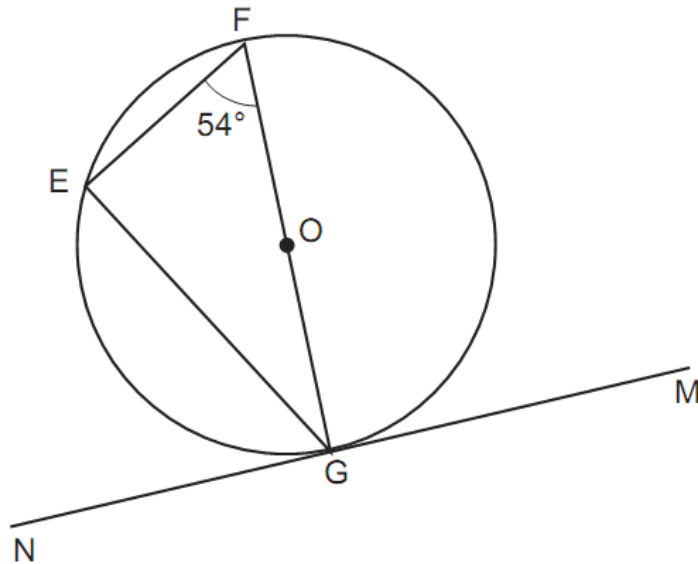


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10.



In the diagram E, F and G are points on the circle, centre O. Angle EFG is 54° . MN is a tangent to the circle at point G.

i) Calculate the size of angle FGE

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ii) Calculate the size of angle EGN

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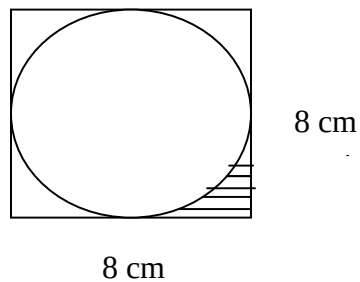
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Chapter 5: Area

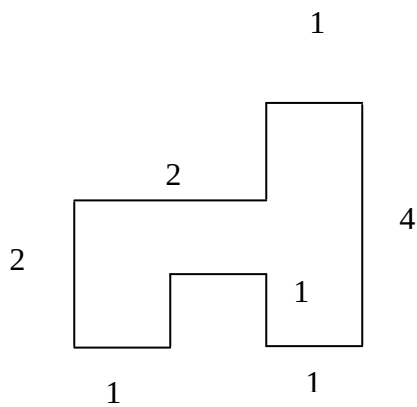
5.1. Multiple choices

1. The shaded area, in cm^2 , is



A	$16 - 2\pi$	B	$16 - 4\pi$
C	$\frac{4}{\pi}$	D	$64 - 8\pi$

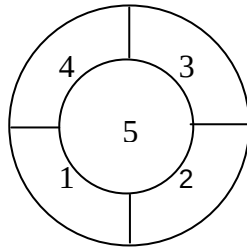
2. In the figure all angles are right angles.



The area, in square units, is

- A. 7
- B. 8
- C. 9
- D. 1

3. The area, in square units, of the quadrilateral with vertices (0,0), (6,0), (6,6), (2,5) is
- A. 20
B. 27
C. 29
D. 36
4. The figure shows two concentric circles, of radii 10 cm and 20 cm, together with parts of a pair of perpendicular diameters.



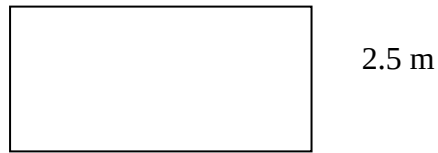
The area of the region marked 3 is

- A. 5π
B. 75π
C. 100π
D. $\frac{1}{4}(400\pi - 100)$
5. Given the area of the rectangle is 350cm^2 , what is the shaded area?



- A. 56cm^2
- B. 126cm^2
- C. 147cm^2
- D. 210 cm^2

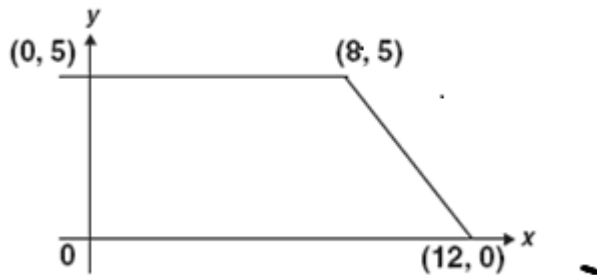
6. The rectangle shown below has a width of 2.5 m and a perimeter of 13 m.



What is the area of the rectangle?

- A. 4 m^2
- B. 8 m^2
- C. 10 m^2
- D. 10.5 m^2

7. What is the area, in square units, of the trapezoid shown below?



- A. 37.5
- B. 42.5

C. 50

D. 100

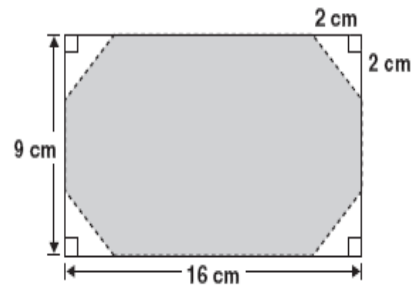
8.

Ali cut four congruent triangles off the corners of a rectangle to make an octagon shown below.

What is the area of the shaded octagon?

A. 128 cm^2 B. 136 cm^2

C. 140 cm^2 D. 152 cm^2



B

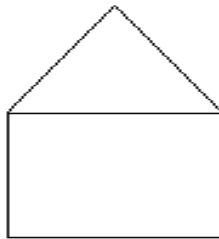
9. In the figure below, the perimeter of the equilateral triangle is 24 cm. What is the area of the square?

A. 32 sq. cm.

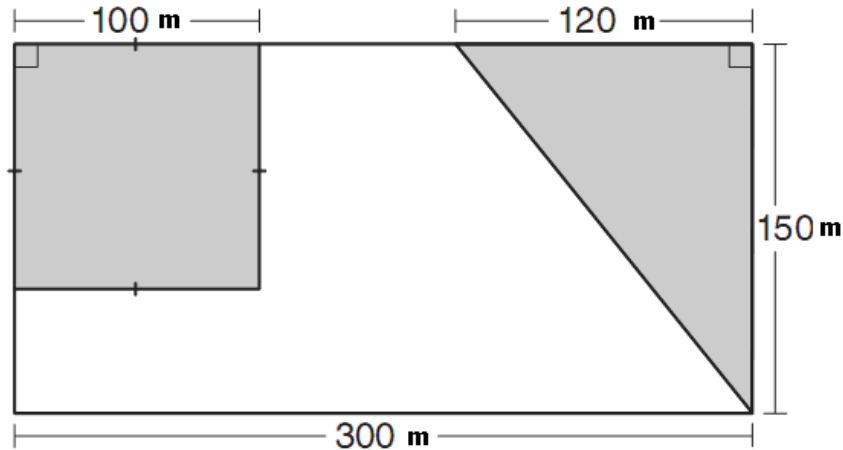
B. 476 sq. cm.

C. 12 sq. cm.

D. 64 sq. cm.



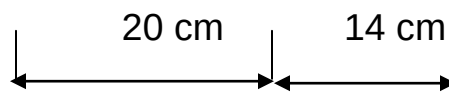
10. What is the area of the UNSHADED part of the rectangle below?

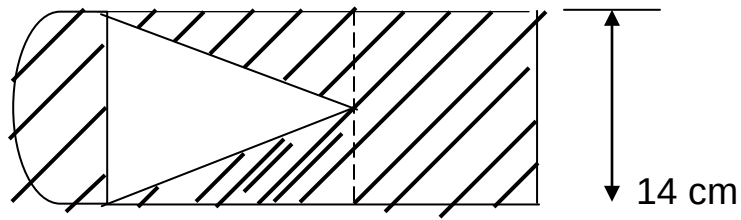


- A. 19 000 m²
- B. 45 000 m²
- C. 28 000 m²
- D. 26 000 m²

5.2. Structured questions

1. Calculate the shaded area. (Take $\pi = \frac{22}{7}$)





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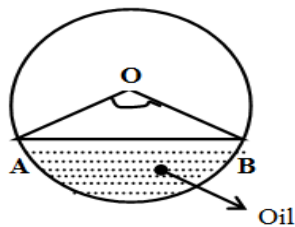
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2. The cross – section of an oil drum is shown. The chord AB subtends an angle. of 120° at the center O. The radius of the circle is 30 cm. Calculate:



- i) The shaded area of the cross – section.

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- ii) The volume of oil (in cm^3) in the drum, if the drum is 2m long. (Take $\pi = \frac{22}{7}$ and $\sin 120^\circ = \sin 60^\circ = 0.8660$)

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3. A square is inscribed in a circle of radius 14 cm.

Find:

- a) the area of the square

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- b) The area shaded. (Take $\pi = \frac{22}{7}$)

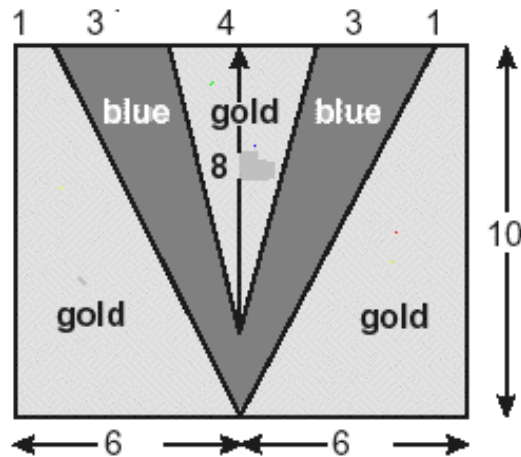
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4.



Students at SOS school decide to have T-shirts made with a blue "V" inside a gold rectangle as shown in the diagram above. The costs are as follows:

- plain T-shirt \$8.50
- blue colouring \$0.02 per square cm
- gold colouring \$0.04 per square cm

a) What is the area of the blue "V" in the diagram above? Show your work.

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b) What is the area coloured gold.

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- c) What will be the total cost for each T-shirt shown above?
Show your work.

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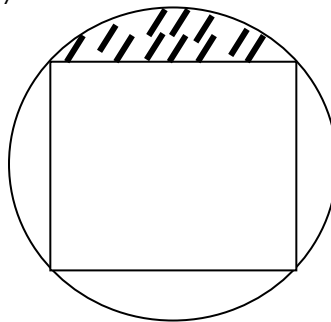
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5. A square ABCD is inscribed in a circle of radius 6 cm. Find the shaded area. Take $\pi = \frac{22}{7}$



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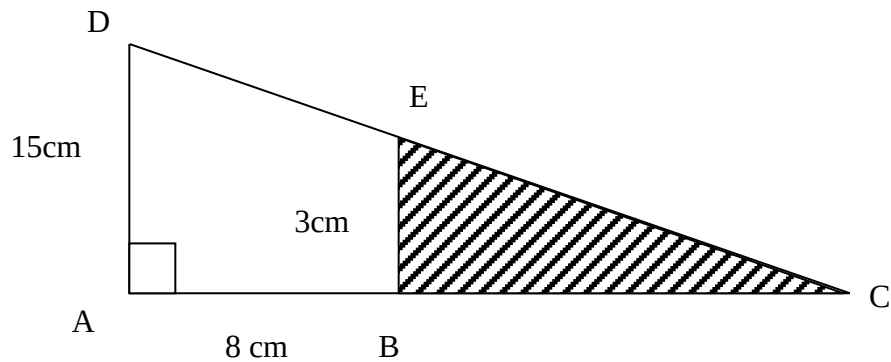
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6. Find the area of the shaded region in the figure below, given that $AD=15\text{cm}$, $BE=3\text{cm}$, $AB=8\text{cm}$ and $\angle DAB = \angle EBC = 90^\circ$.



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Chapter 6: Analytic geometry

6.1. Multiple choices

1. The line $y = 2x - 1$ cuts the x –axis at P. The coordinates of P are

A	$(0, -1)$	B	$(\frac{1}{2}, 0)$
C	$(-\frac{1}{2}, 0)$	D	$(-1, 0)$

2. The equation of the line joining $(12, 32)$ and $(-8, 2)$ is

A. $15x - 2y - 114 = 0$

B. $2y = 3x + 28$

C. $2y + 3x + 20 = 0$

D. $3x + 2y = 100$

3. The gradient of the line $2x + y = 3$ is

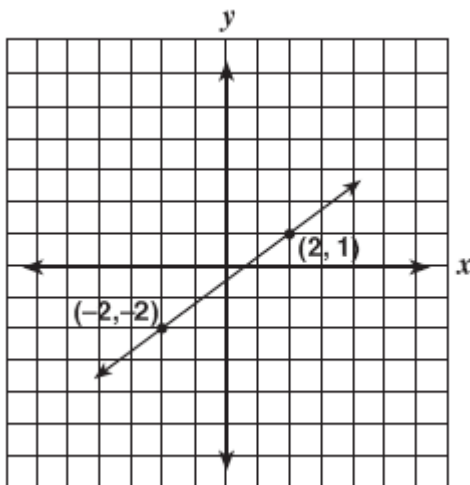
A. 3

B. -2

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

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

4. The line $y = 4x - 8$ meets the x – axis at the point P. What are the coordinates of P?
- A. (0,8)
B. (2,2)
C. (2,0)
D. (0, 2)
5. Given the points A(3,1,2) and B(1,3,3), find $|AB|$, the modulus of AB
- A. $\begin{pmatrix} -2 \\ 2 \\ 1 \end{pmatrix}$
B. $\begin{pmatrix} 2 \\ -2 \\ -1 \end{pmatrix}$
C. 5
D. 2
6. What is the slope (gradient) of this line?



- A $\frac{1}{2}$
B $\frac{3}{4}$
C 1
D $\frac{4}{3}$

7. The table of values for the rule $y = 6x - 11$ is

A

x	-5	-4	-3	-2	-1	0
y	-41	-35	-29	-23	-19	-11

C

x	-1	0	1	2	3	4
y	-17	-11	-6	0	7	13

B

x	-3	-2	-1	0	1	2
y	-29	-23	-17	-11	-5	1

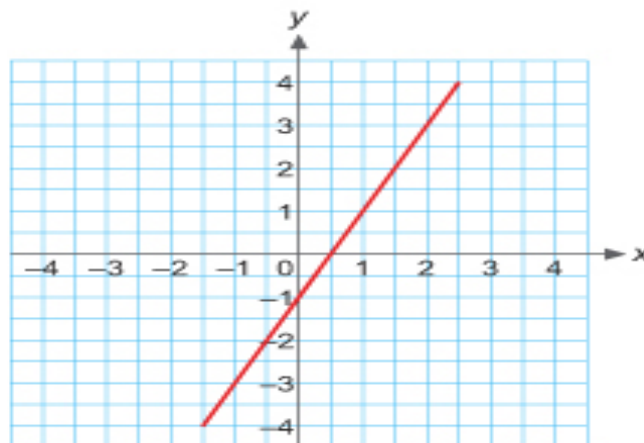
D.

x	-2	-1	0	1	2	3
y	-23	-17	-11	-6	-1	7

8. Which of the following points does not lie on the line $y = 3x - 5$?

- A. (3, 4)
- B. (0, -5)
- C. (-1, -8)
- D. (2, 0)

9. Which one of the following represents the equation of the straight line shown?



A. $y = x - 2$

B. $y = 2x - 2$

C. $y = x - 1$

D. $y = 2x - 1$

10. The coordinate of the mid-points of the line $(-4,6)$ and $(1,-6)$ are

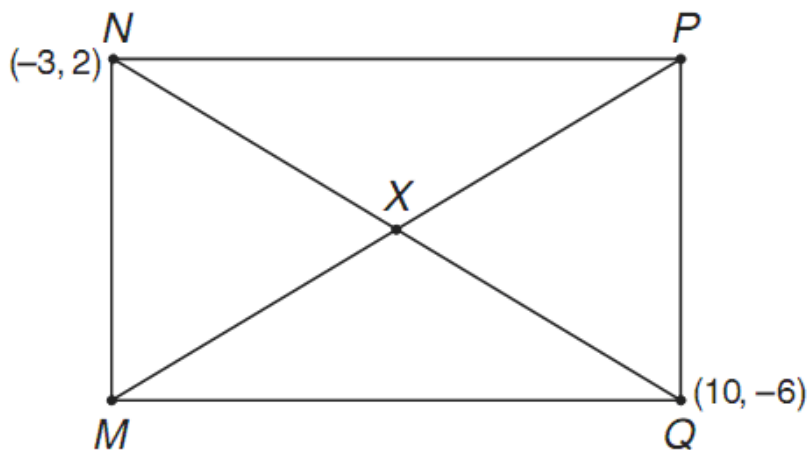
A. $(1.5, 0)$

B. $(-1.5, 0)$

C. $(-5, 1)$

D. $(2, 6)$

11. Rectangle MNPQ has diagonals that intersect at point X.



Which of the following represents point X?

A. $(\frac{7}{2}, -2)$

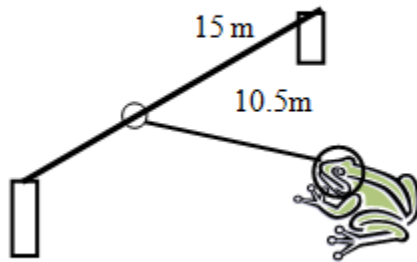
B. $(\frac{13}{2}, 4)$

C. $(-\frac{13}{2}, -4)$

D. $(-\frac{7}{2}, 2)$

6.2. Structured questions

1. (a) A toad is tied by a rope 10.5 m long to a fixed wire 15m long. A ring at the end of the rope can slide along the wire.



- i) Sketch the locus of the toad's head if the toad moves so as to keep as far as possible from the wire, within the given frame.
- ii) Use the value $3\frac{1}{7}$ for π (pie) to calculate approximate length of the locus.

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2. Write the equation of the line passing through (4,4) and
parallel to the line

$$2x - y + 1 = 0.$$

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3. Find the equation o the straight line which passes tough the
point (1,3)And l perpendicular to the line $2y-3x = 7$.

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4. Find the equation of the tangent of the curve $y = x^3 - 3x^2 + 2x - 1$ at the point (3,5)

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5. The equation is $\frac{x^2}{16} - \frac{y^2}{9} = 1$

- a) Find the coordinates of the vertices of the hyperbola

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b) Find the coordinates of its foci?

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6. The equation of the parabola is $(x+2)^2 = 4(y+1)$ Find

a) The coordinates of the vertex

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b) The equation of the directrix

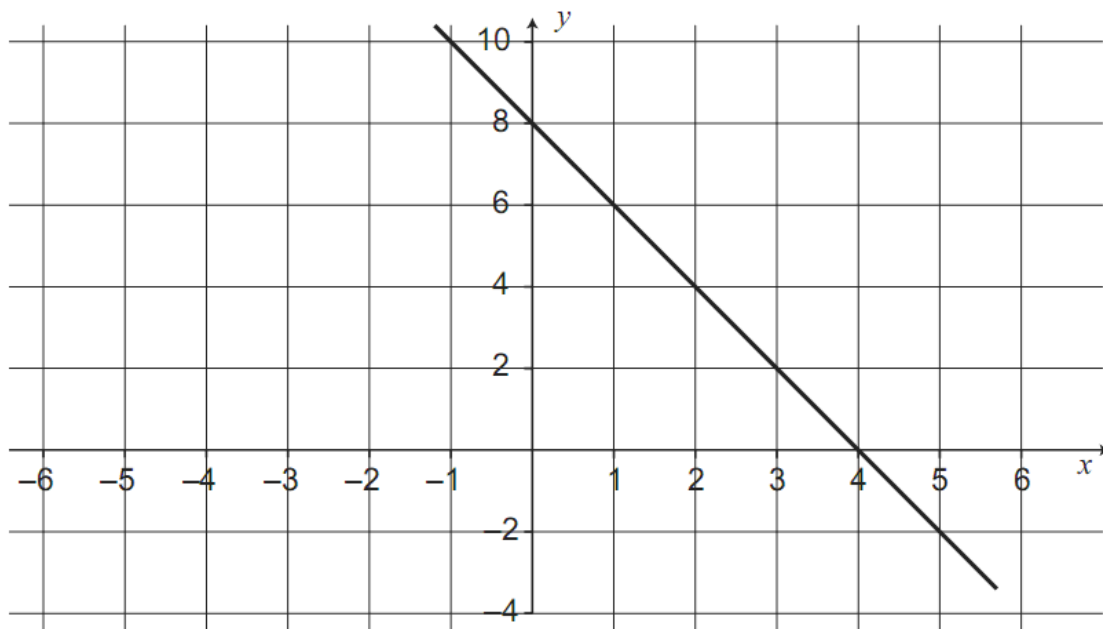
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7.



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straight line has been drawn on the grid.

a) Find the equation of the straight line.

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b) Find the gradient of the line $x+3y=6$.

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c) Find the equation of the line which is parallel to the line with the equation $4x+2y=8$ and passes through the point with coordinates $(0,-1)$.

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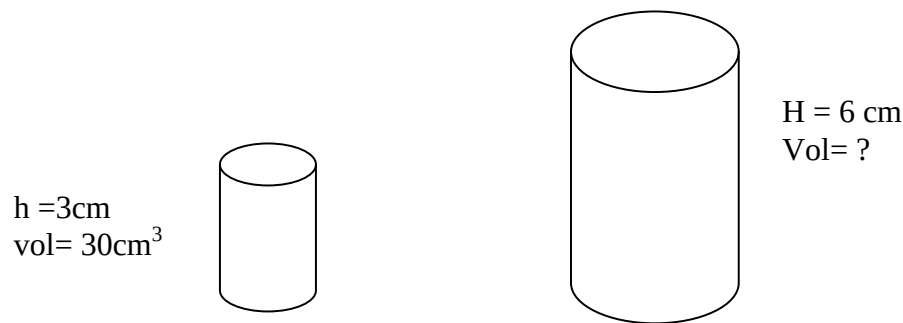
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Chapter7: Solid geometry

7.1. Multiple choices

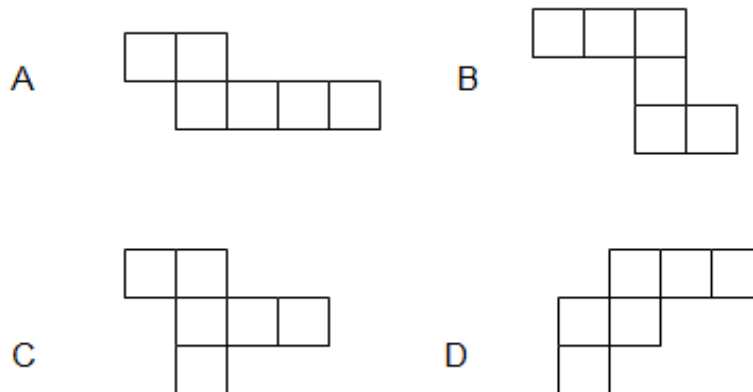
1. Two similar cylinders have heights of 3 cm and 6 cm respectively. If the volume of the smaller cylinder is 30 cm^3 , find the volume of the larger cylinder.



A	120 cm^3	B	240 cm^3
C	60 cm^3	D	180 cm^3

2.

Which of these is the net of a cube?

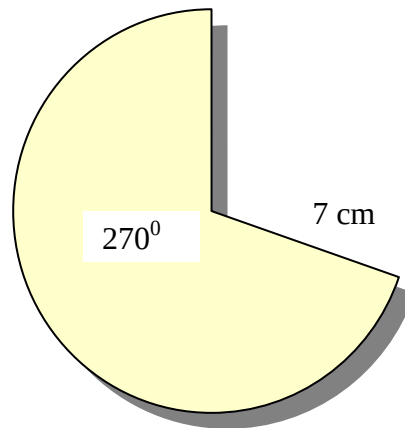


3. The surface area of a closed cube of side x cm is:

- A. $4x$
- B. $4x^4$
- C. x^3
- D. $6x^2$

4. The sector shown is assembled to form a cone. The base circumference of the cone is:

- A. 47
- B. 153
- C. 37
- D. 33



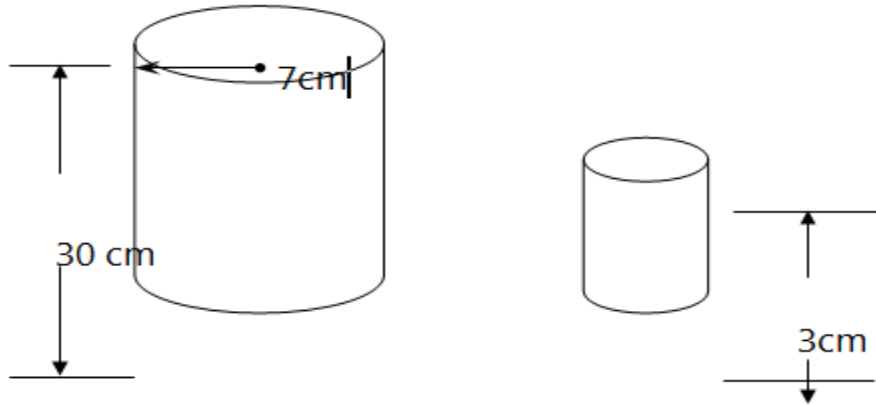
5. The cone shown below has a radius of 8 feet and a height of 12 feet. What is the volume of the cone?

- A. 32π cubic feet
- B. 256π cubic feet
- C. 374π cubic feet
- D. 768π cubic feet



7.2. Structured questions

- Find the area scale factor and the volume scale factor of the above two similar tins



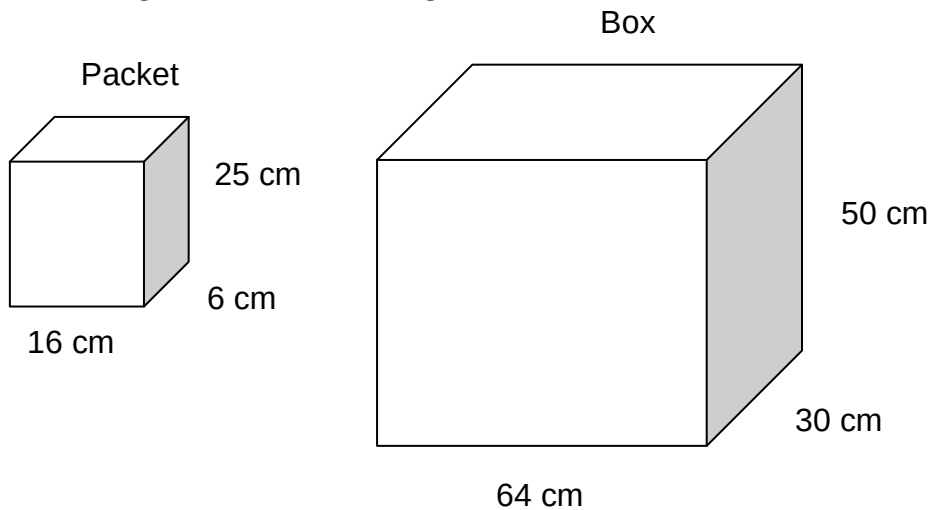
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- A packet of soap powder is a cuboid of breadth of 6 cm, length 16cm and height 25 cm.



a) Calculate the volume of the packet

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b) Calculate the number of packets which can be placed in
rectangular box of breadth 30 cm, length 64 cm and
height 50cm.

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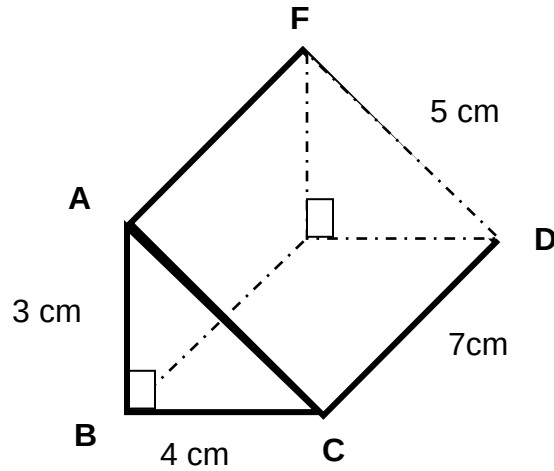
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3. The figure shows a triangular prism.



Find:

a) The surface area.

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b) volume

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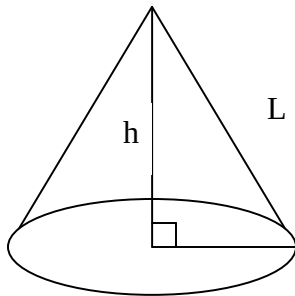
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4. The figure shows a solid cone.



If the base radius (r) is 5 cm and the vertical height (h)
is 12 cm, find

a) the slant height (L)

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b) the total surface area of the cone

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c) the volume of the cone (Take $\pi = \frac{22}{7}$)

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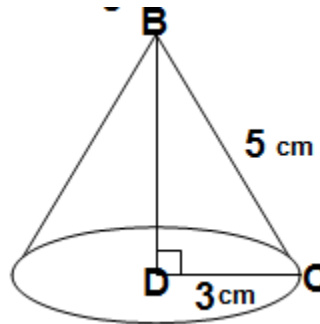
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5. Calculate the surface areas of the following solids

- a. A closed cylinder of $r = 14cm$ and *height* $30cm$
- b. A frustum of a cone with radio , $r_1 = 7cm, r_2 = 21cm$
and total height is $28cm$

6. The diagram shows a cone with base radius $CD = 3 \text{ cm}$
length of $BC = 5 \text{ cm}$ and the Vertical $\angle B = 60^\circ$.



Calculate

- a) The height BD ,

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- b) angle CBD ,

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- c) the volume of the cone

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Chapter 8: Vectors and transformation

8.1. Multiple choices

1. The column vectors PQ, QR, and RS are

$p = PQ = \begin{pmatrix} 7 \\ 1 \end{pmatrix}$, $q = QR = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$, $r = RS = \begin{pmatrix} 4 \\ 4 \end{pmatrix}$. Then $2p - 3q + r$ is

equal to

A. $\begin{pmatrix} 12 \\ -3 \end{pmatrix}$

B. $\begin{pmatrix} 24 \\ -3 \end{pmatrix}$

C. $\begin{pmatrix} 12 \\ 9 \end{pmatrix}$

D. $\begin{pmatrix} 24 \\ 15 \end{pmatrix}$

2. The magnitude of a vector $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$ is equal to

A. 5

B. $-\sqrt{5}$

C. ± 25

D. 6

3. If $a = \begin{pmatrix} 8 \\ 4 \end{pmatrix}$ and $b = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$ find $|a + b|$

A. $\begin{pmatrix} 7 \\ 5 \end{pmatrix}$

B. 13

C. 169

D. $\begin{pmatrix} 12 \\ 4 \end{pmatrix}$

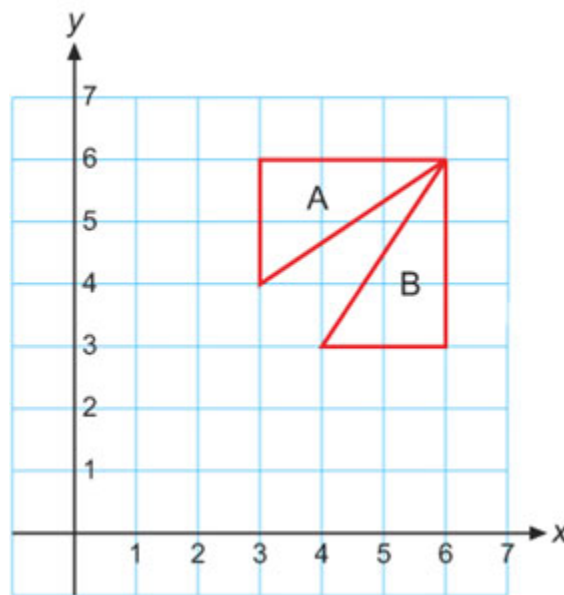
4. The magnitude of the vector $\begin{pmatrix} 4 \\ -3 \end{pmatrix}$

- A. 1
- B. 5
- C. -12
- D. -4

5. If vectors $a = \begin{pmatrix} 5 \\ 6 \end{pmatrix}$ and $b = \begin{pmatrix} 2 \\ 7 \end{pmatrix}$ then $2a - 3b$ is

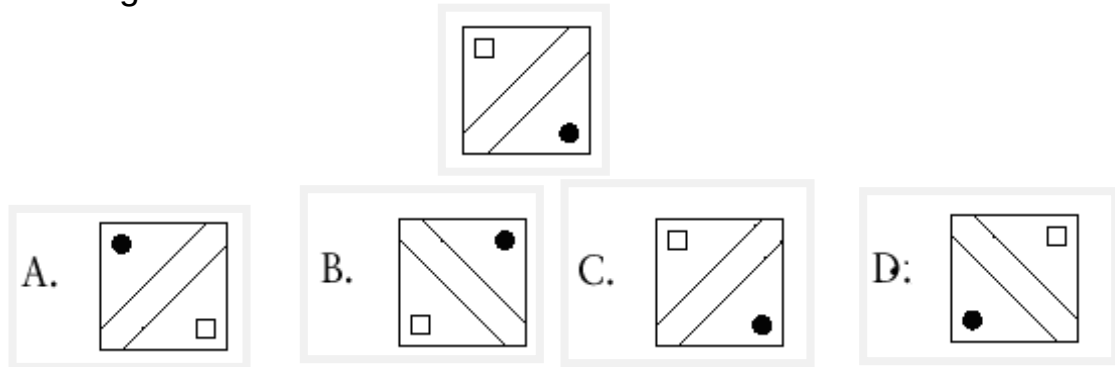
- A. $\begin{pmatrix} 4 \\ 9 \end{pmatrix}$
- B. $\begin{pmatrix} 8 \\ 5 \end{pmatrix}$
- C. $\begin{pmatrix} 4 \\ -9 \end{pmatrix}$
- D. $\begin{pmatrix} -4 \\ 9 \end{pmatrix}$

6. Which of the following describes the transformation which
maps A onto B?



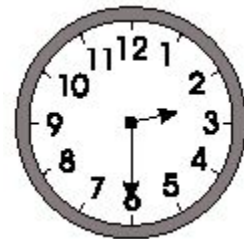
- A. A rotation about the origin.
- B. A reflection in the line $x = -y$
- C. A rotation about the point (6,6)
- D. A reflection in the line $x = y$

7. The following figure is to be rotated 90° clockwise. What will the figure look like after the rotation?

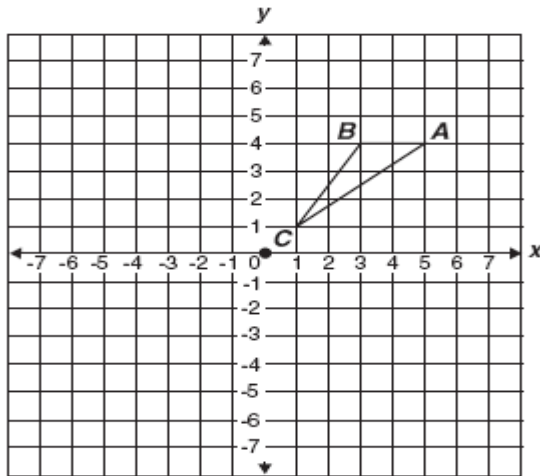


8. What is the measure of the angle between the minute hand and the hour hand when the time on the clock is 2:30?

- A. 60°
- B. 75°
- C. 105°
- D. 120°



9. If triangle ABC is rotated 180 degrees about the Origin,
what are the coordinates of A' ?



- A. (- 5, - 4)
- B. (- 5, 4)
- C. (- 4, 5)
- D. (- 4, - 5)

Chapter 9: Trigonometry

9.1. Multiple choices

1. $\cos(x + 90)^\circ$ equals

A. $-\cos x$

B. $\sin x$

C. $-\sin x$

D. $\cos x$

2. Given $\cos x = \frac{5}{13}$ find $\tan x$, without using tables.

A. $\frac{12}{5}$

B. $\frac{13}{5}$

C. $\frac{5}{12}$

D. $\frac{12}{13}$

3. If $6 \sin x = 3 \cos x$, the value of $\tan x$ is:

A. $\frac{6}{3}$

B. $-\frac{3}{6}$

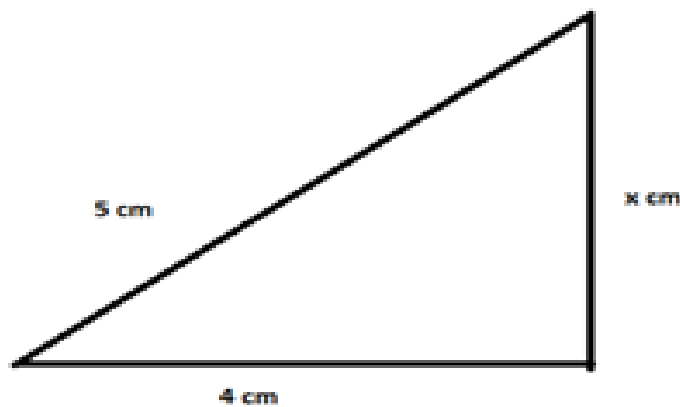
C. 2

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

4. Given $\sin A = \frac{1}{2}$ and $\cos B = \frac{4}{5}$ where A and B are both acute,
the exact value of $\cos(A - B)$ is

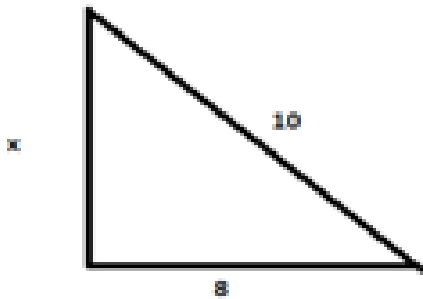
- A. $\frac{\sqrt{3}+2}{5}$
- B. $\frac{\sqrt{3}+4}{10}$
- C. $\frac{4\sqrt{3}+3}{10}$
- D. $\frac{3\sqrt{3}+4}{10}$

5. The length of the side marked x cm in the right-angled triangle is



- A. 4
 - B. 3
 - C. 5
 - D. 25
6. $2 \cos^2 18^\circ - 1$
- A. $\sin 36^\circ$
 - B. $\cos 9^\circ$
 - C. $\cos 36^\circ$
 - D. $\sin 9^\circ$

7. By Pythagorean theorem x is equal to



- A. 6
- B. 7
- C. 9
- D. 10

8. $\sin (45^\circ + A)$ is equal to:

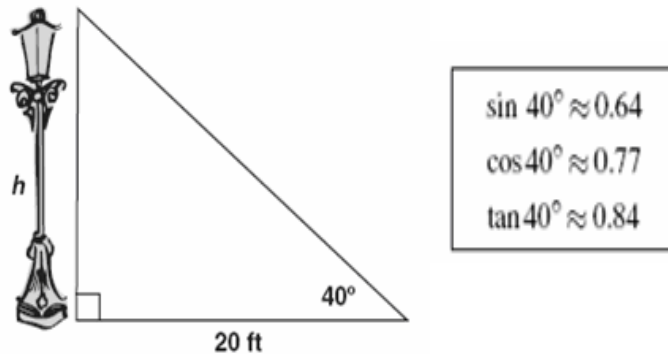
- A. $\frac{\sqrt{3}}{2}(\cos A + \sin A)$
- B. $\frac{\sqrt{3}}{2}(\cos A - \sin A)$
- C. $\frac{\sqrt{2}}{2}(\cos A + \sin A)$
- D. $\frac{-\sqrt{2}}{2}(\cos A + \sin A)$

9. $\sin 2A$ is equal to

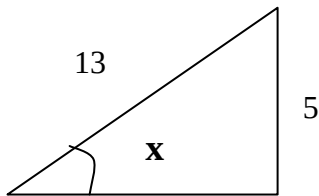
- A. $\sin A + \sin A$
- B. $2\sin A \cos A$
- C. $2 \sin A$
- D. $\cos^2 A - \sin^2 A$

10. Approximately how many feet tall is the Hargeisa streetlight shown?

- A. 12.8
B. 15.4
C. 16.8
D. 23.8



11. The graph below if $\sin x = \frac{5}{13}$ in the given triangle, then $\cos x$ will be:

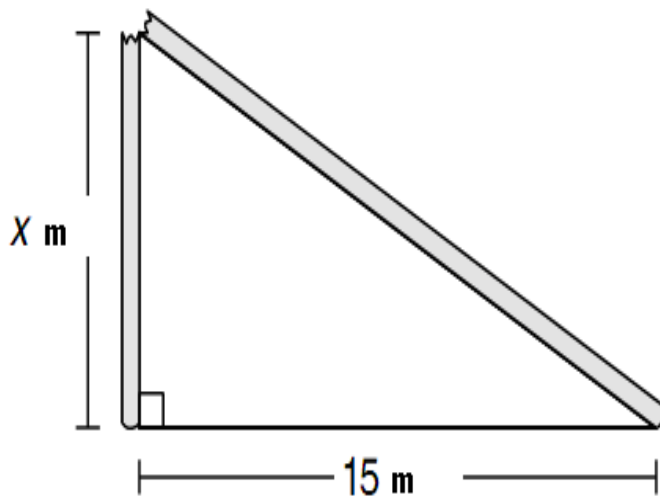


- A. $\frac{5}{12}$ B. $\frac{12}{13}$
C. $\frac{5}{13}$ D. $\frac{13}{12}$

12. Which equation could be used to find the measure of one acute angle in the right triangle shown below?

- A. $\sin A = \frac{4}{5}$
B. $\cos B = \frac{5}{4}$
C. $\tan A = \frac{5}{4}$
D. $\tan B = \frac{4}{5}$

13. A wooden pole was broken during a windstorm in Burao. Before it broke, the total height of the pole above the ground was 25 m. After it broke, the top of the pole touched the ground 15 m from the base.



How tall was the part of the pole that was left standing?

- A. 8 m
 - B. 10 m
 - C. 17 m
 - D. 20 m
14. The expression $\cot \theta \times \sec \theta$ is equivalent to

- A. $\frac{\cos \theta}{\sin^2 \theta}$
- B. $\frac{\sin \theta}{\cos^2 \theta}$
- C. $\operatorname{cosec} \theta$
- D. $\frac{1}{\sin \theta}$

9.2. Structured questions

1. When the sun is at an angle of 30^0 , a tree casts a shadow of 150 m. What is the height of the tree?

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2. (b) Prove that $\text{Cosec } \theta + \text{Sec } \theta \text{ Tan } \theta \equiv \text{Cosec } \theta \text{ Sec }^2 \theta$.

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3.) Given $\sin \theta = \frac{3}{5}$, find:

i) $\cos \theta$

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ii) $\sin 2\theta$.

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4. If $\sin A = \frac{1}{2}$ is an acute angle and $\cos B = \frac{\sqrt{3}}{2}$, find

a) $\sin (A + B)$

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b) $\cos (A + B)$

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5.

a) prove the identity $\cos^2 x + \tan x \sin^2 x = 1$

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b) by putting $x = 15^\circ$ in the above identity find the
exact values of $\tan 15^\circ$

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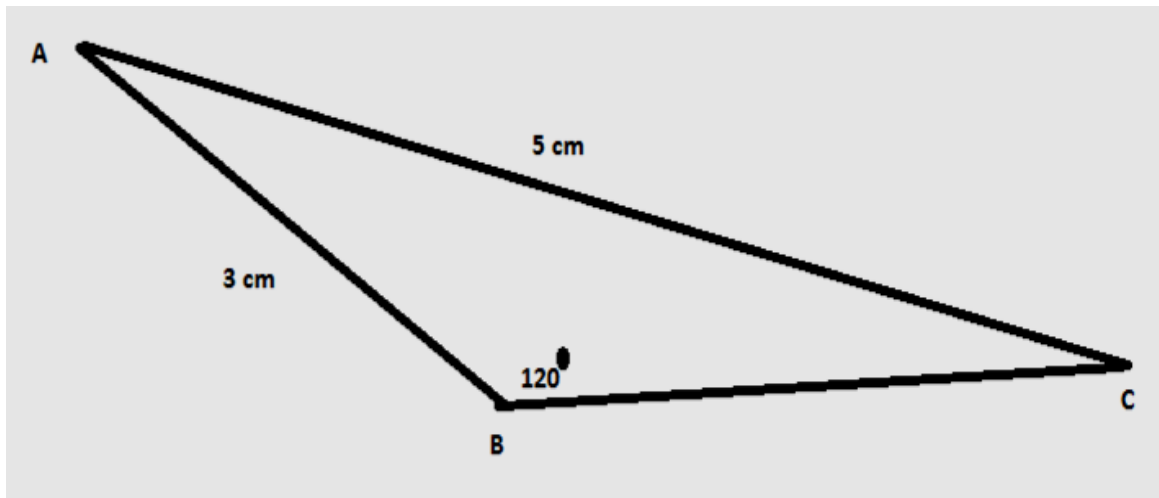
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6.



Use the sine rule to calculate the sin of angle ACB in the above diagram given that $\sin 60^\circ = \frac{\sqrt{3}}{2}$

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7. A ladder of 5.75m in length leans against a wall. The angle of the ladder with the ground is 60° . How far is the foot of the ladder from the wall? Given $\cos 60=0.5$

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8. Solve the trigonometric equation for x, when $0^\circ \leq x^\circ \leq 360^\circ$

$$2\cos^2 x + 3 \cos x + 1 = 0$$

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9. Prove that $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$

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10.prove that $\frac{\tan^2+1}{\tan^2\theta} = \frac{1}{\sin^2\theta}$

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11. Prove that: Given that $\sin^2 y + \cos^2 y = 1$, Show that

$$1 + \tan^2 y = \sec^2 y$$

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12.

a) Given that

$$\sin A = \frac{3}{5} \text{ and } \cos B = \frac{12}{13} : A \text{ and } B \text{ are acute angles.}$$

Find $\cos (A + B)$

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b) Prove that $\frac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1} = \frac{1 + \sin\theta}{\cos\theta}$

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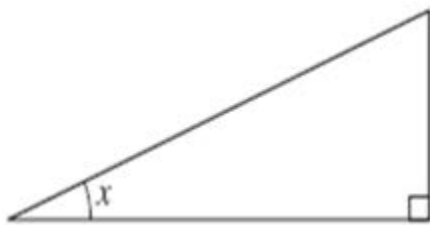
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13. In the figure below, If $\sin x = \frac{5}{13}$, leaving your answers in fraction form,



Find,

i) $\cos x$

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ii) Tan x

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14. Prove that $\cos 3A = 4\cos^3 A - 3 \cos A$

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15. Prove that $\frac{\tan^2 \theta + 1}{\tan^2 \theta} = \frac{1}{1 - \cos^2 \theta}$

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16. Prove that $\sec^2 \theta \operatorname{cosec}^2 \theta - \cot^2 \theta = 1 + \sec^2 \theta$

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17. Given: $\operatorname{cosec} x = \frac{1}{\sin x}$, $\sec x = \frac{1}{\cos x}$, and $\cot x = \frac{1}{\tan x}$

, prove the identities

a) $1 + \tan^2(x) = \sec^2(x)$

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b) $1 + \cot^2(x) = \operatorname{cosec}^2(x)$

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18. Prove that $\sin x + \frac{1 - \cos x}{\sin x} = 2 \sin x$

$$\frac{1 + \cos x}{\sin x} = \frac{1 + \cos x}{\sin x}$$

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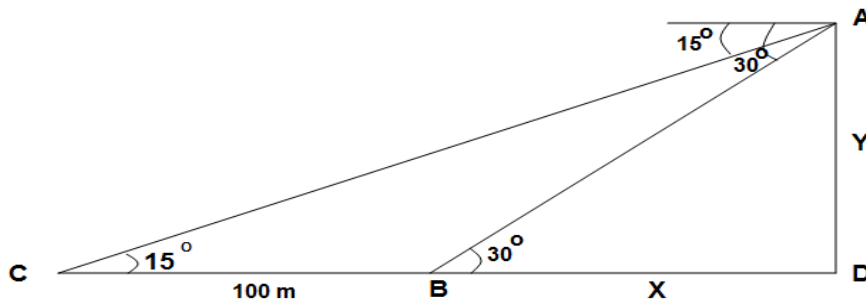
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19. The diagram shows a plane where a pilot at A sights two points 100m apart on the ground. The angles of depression of the two points B and C are 30° and 15° . $\sin 30 = 1/2$. What is the length of BA?



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Chapter 10: Calculus

10.1. Multiple choices

1. Evaluate $\int_2^4 x dx$

- A. 8
- B. 2
- C. 6
- D. 10

2. Find the gradient of the curve $y = 3x^2$ at the point (2,12).

- A. 12
- B. 72.
- C. 3
- D. 8

3. Evaluate $\int_0^2 (3x^2 + 6x + 2) dx$

- A. 36
- B. 12
- C. 24
- D. 26

4. The gradient of the curve $y = (x^3 - 2x^2)^2$ at $x = 2$ is

- A. 8
- B. 4
- C. 0
- D. 40.

5. If $\tan x = \frac{4}{3}$, evaluate $\frac{d}{dx}(\tan x)$

A. $\frac{5}{3}$

B. $\frac{25}{9}$

C. $\frac{5}{4}$

D. $\frac{16}{9}$.

6. Find the equation of the tangent line to the curve $y = 2x^4 - 5x^3$ at $x = 2$.

A. $y = 4x$

B. $y = 4x - 16$

C. $y = 4x - 7$

D. $y = 4x - 2$.

7. The minimum point of the function $y = x^2 - 3x + 2$ is:

A. $(3, 2)$

B. $\left(\frac{3}{2}, -\frac{1}{4}\right)$

C. $(1, 0)$

D. $(2, 0)$.

8. The gradient of the curve: $y \equiv \frac{1}{x^2}$ at $x = 1$ is:

A. -2

B. $-\frac{1}{2}$

C. 2

D. -3 .

9. The value of the integral $A = \int_0^k (2x - 1) dx \equiv 6$ hence, what is the value of?

- A. 1
- B. 2
- C. 3
- D. -4.

10. Differentiating $y = x^3 + 4x^2 + 1$, at $x = 1$, gives

- A. 12
- B. 11
- C. 9
- D. 14

11. The velocity function of a body is given $v = 5 - 2t$. this body is at rest when the time 't' is:

- A. 2.5
- B. 5.2
- C. 2.2
- D. 3.5

12. $\int_0^1 (6x^2 - 2x) dx$ is equal to:

- A. 0
- B. 1
- C. -1
- D. 3

13. integrating $\int (x^2 + 2x)dx$ gives

A. $\frac{x^3}{3} + x^2$

B. $x^3 + 2$

C. $\frac{x^3}{3}$

D. $\frac{x^3}{3} + 1$

14. The derivative of $(3^3 - 5)^2$ is :

A. $6x^2(x^2 - 5)$

B. $6x^2(x^3 - 5)$

C. $6x^3(x^2 - 5)$

D. $8x^3(x^2 - 5)$

15. $\int (x^3 - 4x^2 - 1)dx$ is :

A. $\frac{x^4}{3} - \frac{x^3}{4} - x + c$

B. $\frac{x^4}{3} - \frac{x^3}{4} + x + c$

C. $\frac{x^3}{3} - \frac{x^2}{2} - x + c$

D. $\frac{x^4}{4} - \frac{4x^3}{3} - x + c$

16. The solution of $\int_{-1}^0 (3x^2 - 2x) dx$ is

A. -2

B. 2

C. 4

D. 0

17. The gradient function of the curve $y = 2x^3 - 4x + 2$ is

- A. $6x^2 - 4$
- B. $6x^2$
- C. $\frac{1}{2}x^4$
- D. $6x^2 - 4x + 2$

18. $\frac{d}{dx}(\cos x)$ is:

- A. $-\cos x$
- B. $\sin x$
- C. $-\sin x$
- D. $\tan x$

19. What is the slope (gradient) of the line containing the points (3,4) and (-6,10)?

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

20. The gradient of $y = x^3 - x$ at P(1, 1) equals:

- A. 1
- B. 2
- C. 3
- D. 4

10.2. Structured questions

1. Find the equation of the tangent to the curve $y = 3x^2 + 10x + 5$ at the point (1, 18).

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2. A particle moves in a straight line so that t seconds after passing a fixed point in the line, its velocity v m/s is given by $v = 4t^2 - 5t + 2$. Calculate:

- i) The velocity after 5 s,

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ii) The acceleration when $t = 0$,

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iii) The distance traveled in the third second.

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3. The distance, S metres, moved by a particle from a fixed point after t seconds is given by $S = t^3 - 3t^2 + t + 1$.

Calculate;

i) its velocity when $t=2$

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ii) the time when the velocity is zero

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iii) The acceleration when $t = 3$.

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4. Find the value of the following definite integral.

$$\int_1^3 (x^3 - 1)dx$$

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5. A particle moves in the line OX so that it is 's' metres from O, t seconds after passing O, where $s = 12t^2 - t^3$. Find,

a) Expressions in terms of t , for the velocity and acceleration.

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b) The value of the acceleration when $t = 2$.

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6.

a) Find the co-ordinates of the turning points on the curve $y = x^3 - 3x^2$

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- b) Using the second derivative or the testing method,
distinguish between the minimum and the
maximum turning points.

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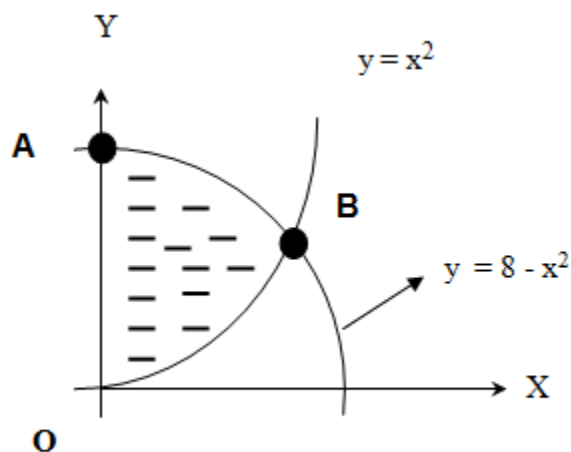
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7. The diagram shows the area between the curves $y = x^2$
and $y = 8 - x^2$ and the y-axis.



a) Find the coordinates of points A and B

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b) Find the shaded area

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8. Find the equation of the straight line L_1 passing through the point $(3, 1)$ and perpendicular to the line L_2 $3x-2y=10$

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9. Find the

(a) Gradient of the curve $y = 6x^2 - 2x - 4$ at $x = 3$

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(b) Value of x at the minimum point. You must show that it is a minimum.

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10.

a) Calculate the area between the curves $y = 4 - x^2$ and $y = x^2 - 4$

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b) Work out $\int x^2 \left(\sqrt[3]{(x^3 + 3)^{11}} \right) dx$

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11. A particle has travelled $s = -23t + 122t^2 - t^3$ ft. calculate

a) Its velocity after 5 seconds.

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b) Its acceleration after 2 seconds

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12. Determine the derivative of :

a. $y = x^5 + 2\sqrt{x^3} - \frac{4}{x^3}$

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b. $y = \sqrt{(x^2 - 2)^3}$

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13.

a. Calculate the coordinates of the stationary
points on the curve $y = x^3 - 12x$

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b. Determine the nature of the stationary

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14. The velocity in (cm/s) of a moving particle, after t seconds is given by $v = at^2 - 4t + 3$ calculate

a) The velocity after zero seconds

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b) the displacement after 1 seconds

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c) The acceleration after $\frac{1}{2}$ second.

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15. $\int_0^5 (4x^3 - x^2 + 2x - 1)dx$

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16. Find the turning points on the graph of $y = x^3 - 3x^2$ and distinguish between the maximum and minimum

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17.

- a. Calculate the equation of the tangent to the
curve

$y = 5x^3 - 2x^2 + 10x - 3$ at the point (1,10)

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- b. Find the area bounded between the curves

$f(x) = -x^2 + 2x + 10$ and $g(x) = x^2 - 2x + 10$

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18.

- a) Given $\frac{dy}{dx} = 2x + 3$ and $x = 1$ when $y = 9$, find
the equation of y the terms x .

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- b) Given $y = 4x^3 + x + 1$, obtain the equation of
a tangent to the curve at $x=2$.

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19. A curve has equation $y = x^3 + 6x^2 - 16$.

Find:

a) $\frac{dy}{dx}$

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b) the coordinates of the turning(stationary) points

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c) Identify each turning point as a maximum or minimum, and justify your answer

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20. Evaluate $\int_2^3 (3x^2 - 4x + 5)dx$

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21. The acceleration of a particle from rest is given by $a = 10 - 3t$. Find the

i) acceleration after 2 seconds

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ii) Velocity after 2 seconds

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22. Find the coordinates of the turning point of the curve with
equation $y = -x^2 + 4x + 1$

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23. What is the slope (gradient) of a line perpendicular to the line whose

Equation is $5x + 3y = 8$?

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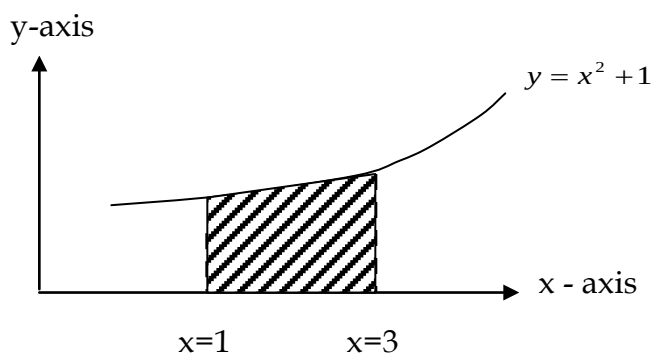
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24. Find the area under the curve $y = x^2 + 1$ between $x=1$ and $x=3$.



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25. The displacement, S metres, covered by a moving particle after time, t seconds, is given by

$$S = 2t^3 + 4t^2 - 8t + 4 . \quad \text{Find:}$$

a) Velocity at $t = 2$

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b) The acceleration at $t = 3$ seconds

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c) Instant at which the particle is at rest

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26. Find the area under the curve $y = x^2 + 3x + 2$ bounded by the y axis , $x = 3$,
and the x axis.

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ANSWERS

Chapter 1: Algebra

1.1 Multiple choices

1. C
2. A
3. A
4. B
5. A
6. D
7. C
8. A
9. C
10. B
11. A
12. B
13. C
14. A
15. A
16. A
17. C
18. B
19. A
20. D
21. C
22. B

- 23. D
- 24. A
- 25. C
- 26. B
- 27. A
- 28. D
- 29. C
- 30. C
- 31. D
- 32. A
- 33. B
- 34. A
- 35. A
- 36. B
- 37. C
- 38. C
- 39. A
- 40. D
- 41. B
- 42. A
- 43. C
- 44. D
- 45. D
- 46. A
- 47. C
- 48. A 49. D 50. D 51. C 52. A 53. B

1.2 Structured questions

1. 8

2. $x^2 + 10x + 3$

$$x^2 + 9x + x + 3$$

$$x(x+3) + 1(x+3)$$

$$(3x+1)(x+3)$$

3. $\frac{6(4x-1)}{3} - \frac{6(2x-3)}{2} = 6$

$$8x - 2 - 6x + 9 = 6$$

$$2x + 7 = 6$$

$$x = -\frac{1}{2}$$

4. $5x + 15 = 100 \Rightarrow 5x = 85 \Rightarrow x = 17$

5.

a) Let x be the age of the son then his father will be $5x$

$$5x + 5 = 3(x + 5)$$

$$5x + 5 = 3x + 15$$

$$5x - 3x = 15 - 5$$

$$2x = 10$$

$$x = 5$$

The son's age is 5yrs and his father is 25yrs

$$b) 5x^2 + x - 4 = 0$$

$$5x^2 + 5x - 4x - 4 = 0$$

$$5x(x + 1) - 4(x+1) = 0$$

$$(5x-4)(x+1) = 0$$

$$x = \frac{4}{5} \text{ or } x = -1$$

6.

$$\begin{array}{l} 2 \left| \begin{array}{l} 3x + 2y = 13 \\ 5x - 3y = 9 \end{array} \right. \\ \hline 9x + 6y = 39 \\ 10x - 6y = 18 \\ \hline 19x = 57 \\ x = 3 \end{array}$$

$$\begin{array}{l} \text{Now find } y \\ 3x + 2y = 13 \\ 3(3) + 2y = 13 \\ 9 + 2y = 13 \\ 2y = 13 - 9 \\ 2y = 4 \\ y = 2 \end{array}$$

$$7. 12x - 8 - 6x + 3 = 6 - 5x$$

$$12x - 6x + 5x = 6 + 8 - 3$$

$$11x = 11 \Rightarrow x = 1$$

8.

a) $X+4$

i. $(x - 7)^2 = (x + 4) + 1$

$$x^2 - 14x + 49 = x + 5$$

$$x^2 - 15x + 44 = 0$$

b) $x^2 - 15x + 44 = 0$ $x^2 - 11x - 4x + 44 = 0$

$$x(x - 11) - 4(x - 11) = 0$$

$$(x - 11)(x - 4) = 0$$

$$x = 11 \text{ or } x = 4$$

9. a) $3(x - 1) = 18$

b) $\frac{x}{12} = \frac{6}{8}2^x = 2^4$

$$3x - 3 = 18x = \frac{6 \times 12}{8} \quad \therefore x = 4$$

$$3x = 18 + 3x = \frac{72}{8}$$

$$3x = 21 = 9$$

$$\therefore x = 7$$

10.

a)

$$\begin{array}{l|l} 8 & 2x-5y = 24 \\ 5 & 7x+8y= 33 \end{array}$$

$$16X-40Y=192$$

$$35X+40Y=165$$

$$51X=357 \quad \therefore X = 7$$

$$\text{In eq.2, } y = \frac{-7x+33}{8} = \frac{-7(7)+33}{8} = -2$$

The solution set is $x=7$ and $y=-2$

11. $p = 2(L + B)$

$$P = 2L + 2B$$

$$2L = P - 2B$$

$$\therefore L = \frac{P - 2B}{2}$$

12. $\left(3\frac{4}{5} - 2\frac{3}{4}\right) \times 1\frac{2}{3}$

$$\left(\frac{19}{5} - \frac{11}{4}\right) \times \frac{5}{3}$$

$$\left(\frac{76 - 55}{20}\right) \times \frac{5}{3}$$

$$\frac{21}{20} \times \frac{5}{3} = \frac{105}{60} = 1.75$$

13. 0.5625

14. $c = \frac{3}{2}n + 300$

15. $s = \frac{p+q}{p}sp = p+q \Rightarrow sp-p = q \Rightarrow p(s-1) = q$

$\Rightarrow p = \frac{q}{s-1}$

16. $2(x - 1) = 6$

$2x-2 = 6$

$2x = 6+2$

$2x = 8$

$x = 4$

17. (i) $3y+7=28$

$3y = 28-7 \Rightarrow 3y = 21$

$y = 3$

(ii) $2(3p+2)=19 \Rightarrow 6p+4 = 19 \Rightarrow 6p = 19-4$

$\Rightarrow P = 2.5$

18. $6x^2 + 13x - 5 = 0$

$$6x^2 - 2x + 15x - 5 = 0$$

$$2x(3x - 1) + 5(3x - 1) = 0$$

$$(3x - 1)(2x + 5) = 0$$

$$3x - 1 = 0 \text{ and } 2x + 5 = 0$$

$$x = \frac{1}{3} \text{ and } x = -\frac{5}{2}$$

19. $D = \sqrt{\frac{3h}{2}}$ squaring both sides we obtain

$$D^2 = \frac{3h}{2}$$

$$h = \frac{2D^2}{3}$$

20. By elimination method

$$\begin{array}{r|l} 4x + y = 3 & \\ 2x - 3y = 13 & \end{array} \quad \begin{array}{l} \text{Substituting } x \text{ by } 2 \text{ find } y. \\ y = 5 - 4x \\ y = 5 - 4(2) \\ y = -3 \\ 14x = 28 \\ x = 2 \end{array}$$

The solution set is $x = 2$ and $y = -3$

$$21. \quad X^2 + x - 12$$
$$(x+4)(x-3)$$

$$22. \quad 6x + 5 = 7x - 2$$

$$7x - 6x = 5 + 2$$

$$x = 7$$

$$23. \quad \frac{25(x-5)}{(x-5)(x+5)} = \frac{25}{x+5}$$

Chapter 2: Functions

2.1 Multiple choices

1. D
2. C
3. A
4. A
5. A
6. B
7. D
8. C
9. C
10. C

2.2 Structured questions

$$1. f\{g(x)\} = \frac{3\left(\frac{2x+1}{3}\right)-1}{2} = x \text{ and } g\{f(x)\} = \frac{2\left(\frac{3x-1}{2}\right)+1}{3} = x$$

$$\therefore f\{g(x)\} = g\{f(x)\}$$

2.

$$a) F(X) = 3-2X$$

$$F(-3/4) = 3-2(-3/4)$$

$$= 4.5$$

$$\text{b) } g(x) = \frac{x+1}{4}$$

$$g(-1) = \frac{-1+1}{4}$$

$$= \frac{0}{4} = 0$$

$$\text{c) Let } y = f(x) \Rightarrow y = 3-2x$$

Interchange x and y and then find y

$$x = 3-2y \Rightarrow 2y = -x+3$$

$$y = \frac{-x+3}{2}$$

$$\text{d) } g(x) = \frac{x+1}{4} \quad gf(x) = \frac{(3-2x)+1}{4}$$

$$= \frac{4-2x}{4}$$

$$= 1 - \frac{x}{2}$$

$$\text{e) } f(x) = 3-2x \quad fg(x) = 3-2\left(\frac{x+1}{4}\right)$$

$$= 3 - \left(\frac{x+1}{2}\right)$$

$$= \frac{6-x+1}{2}$$

$$= \frac{7-x}{2}$$

3. $f^{-1}(x) = \frac{2x-3}{4}$

4.

a) $f(x) = 3x^2 + 5x$

$$f(g(x)) = 3(2x-5)^2 + 5(2x-5)$$

$$= (6x-15)^2 + 10x - 25$$

b) $f(g(x)) = (6x-15)^2 + 10x - 25$

$$f(g(2)) = (6(2)-15)^2 + 10(2) - 25 = 4$$

c) $g(x) = 2x - 5$

$$g(f(x)) = 2(3x^2 + 5x) - 5$$

$$= 6x^2 + 10x - 5$$

d) $g(x) = 6x^2 + 10x - 5$

$$g(f(-1)) = 6(-1)^2 + 10(-1) - 5 = -9$$

5.

a) $f(x) = x^2 + 3$

$$f(-4) = -4^2 + 3 = 19$$

b) $x^2 + 3 - 54 = 0$

$$(x + 9)(x - 6) = 0$$

$$\therefore x = 6 \text{ or } -9$$

Chapter 3: Inequality

3.1 Multiple choices

1. D
2. B
3. C
4. B
5. B
6. A
7. A
8. D
9. A

3.2 Structured questions

1.

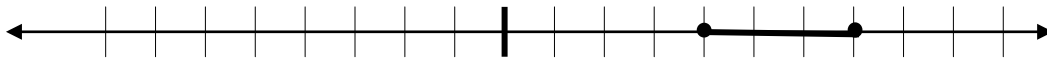
$$13 \leq 2x + 5 \quad \text{and} \quad 2x + 5 \leq 19$$

$$13 - 5 \leq 2x \quad \text{and} \quad 2x \leq 19 - 5$$

$$8 \leq 2x \quad \text{and} \quad 2x \leq 14$$

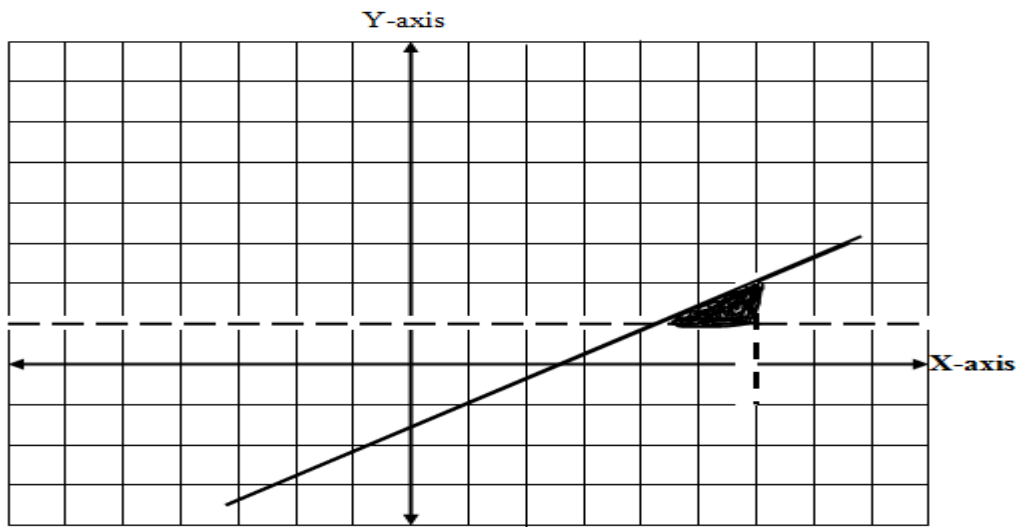
$$4 \leq x \quad \text{and} \quad x \leq 7$$

The solution set is $4 \leq x \leq 7$



2.

0



3. $4x+12 \leq 15x-54$

$$4x-15x \leq -54-12$$

$$-11x \leq -66$$

$$x \geq 6$$

4. $4x+2x < 10+2$

$$6x < 12$$

$$x < 2$$

Chapter 4: Plane geometry

4.1 Multiple choices

1. A
2. C.
3. D
4. A
5. C
6. B
7. C
8. B
9. D
10. A
11. D
12. C
13. C
14. B
15. B
16. B
17. C
18. B
19. A
20. B
21. C
22. A 23.D 24.C

4.2 Structured questions

1. $x = 60$ and $y = 120$

2. a) $\overrightarrow{ST} = OT - OS = 4T - 4S = 4(T - S)$

b) $\overrightarrow{SP} = \frac{2}{3}[4(t - s)] = \frac{8}{3}(t - s)$

c) $\overrightarrow{OP} = 4S + \frac{8}{3}(T - S) = \frac{12S + 8T - 8S}{3} = \frac{4S + 8T}{3} = \frac{4}{3}(S + 2T)$

3.

a) The interior angle of hexagon is $\frac{180(6-2)}{6} = 120$

The interior angle of a regular polygon is $120 + 48 = 168$

b) 30 sides

4. Using the cosine formula

a) $(BC)^2 = 10^2 + 12^2 - 2(10)12\cos 60$

$$(BC)^2 = 100 + 144 - 120$$

$$(BC)^2 = 124$$

$$BC = 11.235$$

b) When $A = 45$

$$(BC)^2 = 100 + 144 - 2(10)(12)\cos 45$$

$$(BC)^2 = 244 - 169.7$$

$$(BC)^2 = 74.3$$

$$BC = 8.619$$

$$\therefore \text{the decrease in } BC \text{ is } 11.135 - 8.619 = 2.51$$

5. Let x be the breadth of the class room. Then the length of the class room will be $x+3$. We know that area of rectangle = breadth $\times$ length

$$270 = (x)(x+3)$$

$$x^2 + 3x - 27 = 0 \text{ by factorizing we get } x = 15$$

Therefore the dimensions of the room are 15m by 18m

$$6. \text{ NOP} = 140^\circ$$

7. Parallelogram cuboid ...hexagonal...cylinder ...

isosceles....triangle

8.

a) Angle AOC = 100° angle at the centre is twice the angle
at the circumference

b) Angle ADC = 130 Supplementary angle to Angle
ABC

c) Angle BAC = 72 the angle between the tangent and
the chord is equal to the angle subtended by the chord

d) Angle OAB = Angle BAC- Angle OAC

$$= 72-40$$

$$= 32^{\circ}$$

9. Perimeter = $(x+5) + (3x+2) + (x+13) + (3x) + 8 + 2$

$$= 8x+30$$

10.

- i) Angle FEG is 90° opposite to the
diameter

Angle FGE = $90^{\circ} - 54^{\circ}$ complementary angles

Angle FGE = 36°

- ii) The size of angle EGN is 54 alternate
segments

Chapter 5: Area

5.1 Multiple choices

1. B
2. A
3. B
4. B
5. D
6. C
7. C
8. B
9. B
10. D

5.2 Structured questions

1. Shaded area = $34 \times 14 + \frac{1}{2} \pi 7^2 - \frac{20 \times 14}{2}$
 $= 413$

2.

a) Shaded area = $\frac{\pi r^2 \theta}{360} - \frac{r^2 \sin \theta}{2}$
 $= \frac{\frac{22}{7} 30^2 \times 120}{360} - \frac{30^2 \sin 120}{2}$
 $= 942.86 - 389.7$
 $= 553.16 \text{ cm}^2$

b) Volume = cross-sectional area x height

$$= 553.16cm^2 \times 200cm$$

$$= 110632cm^3$$

3.

a) let x be the side of the square. By using the Pythagoras

theorem

$$x^2 + x^2 = 28^2$$

$$2x^2 = 784$$

$$x^2 = 392 \dots\dots\dots \text{the area of the square}$$

$$\text{b) The area shaded} = \frac{\text{area of the circle} - \text{area of the square}}{4}$$

$$= \frac{\pi r^2 - 392}{4}$$

$$= \frac{\frac{22}{7}14^2 - 392}{4}$$

$$= \frac{616 - 392}{4} = 56cm^2$$

$$4. \text{ Area of the blue (V)} = \frac{10 \times 10}{2} - \frac{8 \times 4}{2} = 50 - 16 = 34cm^2$$

$$\text{a) Area coloured gold} = 120 - 34 = 86cm^2$$

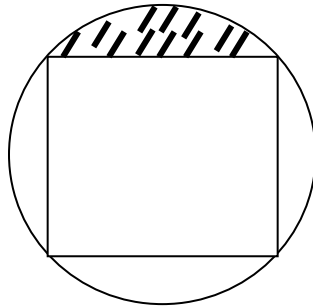
b) Total cost = cost of plain T-shirt + cost of blue + cost of
gold

$$= 8.5 + (34 \times 0.02) + (86 \times 0.04)$$

$$= 8.5 + 0.68 + 3.44 = 12.6$$

∴ The total cost for each T-shirt is \$12.6

5.



Let x be the side of the square.

Using the Pythagoras theorem

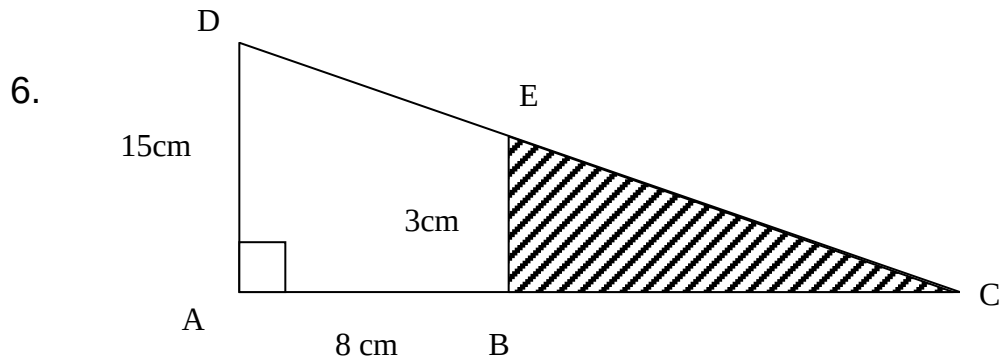
$$x^2 + x^2 = 12^2 \quad x^2 = 72 \quad \dots \dots \dots \text{Area of square}$$

$$\pi r^2 \quad \dots \dots \dots \text{Area of circle}$$

$$\text{The shaded area} = \pi r^2 - 72$$

$$= \left(\frac{22}{7}\right)(6^2) - 72$$

$$= 41.14 \text{cm}^2$$



Let $x = BC$, then $AC = 8\text{cm} + x$

Using the property of similar triangles

$$\frac{AC}{BC} = \frac{AD}{BE} = \text{which gives } \frac{8\text{cm} + x}{x} = \frac{15\text{cm}}{3\text{cm}} \quad X = 2\text{cm}$$

$\therefore$ The shaded area = the area of the smaller triangle

$$= \frac{1}{2} (3\text{cm})(2\text{cm}) = 3\text{cm}^2$$

Chapter 6: Analytic geometry

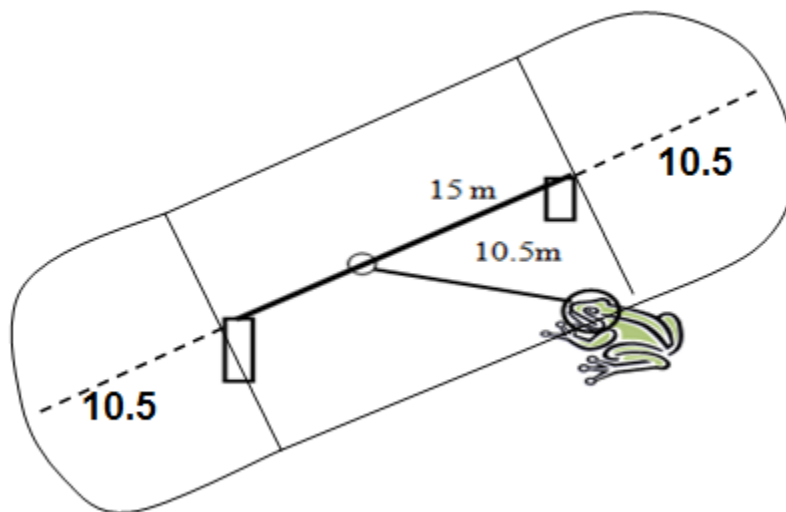
6.1 Multiple choices

1. B
2. B
3. B
4. C
5. D
6. B
7. B
8. D
9. D
10. B
11. A

6.2 Structured questions

1.

i.



ii.

$$\text{Length of locus} = \pi r + \pi r + 15 + 15$$

$$= 2\pi r + 30$$

$$= 2(22/7)(10.5) + 30$$

$$= 96\text{m}$$

2. The slope of the line passing through the point (4, 4) is 2

$$y - y_1 = m(x - x_1)$$

$$y - 4 = 2(x - 4)$$

$$y = 2x - 8 + 4$$

$$y = 2x - 4 \dots\dots\dots \text{Equation of the line}$$

3. The slope of the line $2y - 3x = 7$ is $\frac{3}{2}$

The slope of the perpendicular line is $-\frac{2}{3}$

$$\therefore y - 3 = -\frac{2}{3}(x - 1)$$

$$y - 3 = -\frac{2}{3}x + \frac{2}{3}$$

$$y = -\frac{2}{3}x + \frac{2}{3} + 3$$

$$\therefore y = -\frac{2}{3}x + \frac{11}{3} \dots \dots \dots \text{equation of the straight line.}$$

4. First find the slope of the tangent to the curve

$$m = 3x^2 - 6x + 2$$

$$m = 3(3)^2 - 6(3) + 2$$

$$m = 27 - 18 + 2$$

$$m = 11$$

$$\therefore y - 5 = 11(x - 3)$$

$$y - 5 = 11x - 33$$

$$y = 11x - 33 + 5$$

$$y = 11x - 28 \dots \dots \dots \text{Equation of the tangent}$$

5.

a) V (a, 0) and v(-a, 0). The coordinates of the vertices of the hyperbola are V (4,0) and v(-4,0)

b) First find C where $C = \sqrt{a^2 + b^2} = \sqrt{4^2 + 3^2} = 5$ Foci = (5,0) and (-5,0)

6.

a) Vertex = (h, k) = (-1, -2)

the equation is the form of $(x - h)^2 = 4p(y - k)$

directrix; $y = k - p$

$\therefore k = 1 \text{ and } 4p = y, p = 1$

$\therefore \text{directrix}, y = -1 - 1 = -2$

7.

a) Using two intercept form equation of a line we get

$$\frac{x}{4} + \frac{y}{8} = 1$$

$$2x + y = 8$$

$$y = -2x + 8$$

b) $m = -\frac{1}{3}$

c) The slope of the line with the equation $4x + 2y = 8$ is -2 The slope of the line which is parallel to the line with the equation $4x + 2y = 8$ is also -2 since the two lines are parallel The equation of the parallel line passing through the point (0, -1) with slope -2 is

$$Y - y_1 = m(x - x_1)$$

$$y + 1 = -2(x - 0)$$

$$y = -2x - 1$$

Chapter 7: Solid geometry

7.1 Multiple choices

1. B
2. C
3. D
4. D
5. B

7.2 Structured questions

1. Linea scale factor = $\frac{30}{3} = 10cm$

area scale factor = $(10cm)^2 = 100cm^2$

volume scale factor = $(10cm)^3 = 1000cm^3$

2.

a) $V = 16cm \times 6cm \times 25cm = 2400cm^3$

b) The volume of the rectangular box is $64cm \times 30cm \times 50cm = 96000cm^3$ 40 packets can be placed in the rectangular box

3.

a. The surface area = $7\text{cm}(3\text{cm}) + 7\text{cm}(4\text{cm}) + 7\text{cm}(5\text{cm}) +$ -

$$2\left(\frac{3\text{cm} \times 4\text{cm}}{2}\right)$$

$$= 21\text{cm}^2 + 28\text{cm}^2 + 35\text{cm}^2 + 12\text{cm}^2$$

$$= 96\text{cm}^2$$

b. $v = \text{base area} \times \text{height}$

$$= 6\text{cm}^2 \times 7\text{cm}$$

$$= 42\text{cm}^3$$

4.

$$\text{a) } L = \sqrt{12^2 + 5^2} = 13\text{cm}$$

b) the total surface area = $\pi r(l + r)$

$$= \frac{22}{7}(5\text{cm})(13\text{cm} + 5\text{cm})$$

$$= 282.857\text{cm}^2$$

$$\text{c) } V = \frac{\pi r^2 h}{3} = \frac{\frac{22}{7}(5^2)(12)}{3} = 314.2857\text{cm}^3$$

5.

a. $S.A = 2 \pi r(r+h)$

$$= 2\pi \times 14(14+30)$$

$$= 1232 \pi$$

b. $h_2 = 28, \frac{h_1}{28} = \frac{7}{21} = h_1 = \frac{28}{3}$

$$l_2 = 35 \text{ and } l_1 = 11.6667$$

$$S.A = \pi r_2(l_2+r_2) - \pi r_1(l_1+r_1) + \pi r_2^2 + \pi r_1^2$$

$$= 21\pi(46) - 7\pi(18.67) + 441\pi + 49\pi$$

$$= \pi(835.31 + 441 + 49)$$

$$= 4163.58416 \text{ sq.cm}$$

6.

a. $BD = \sqrt{5^2 - 3^2} = 4$

b. $\text{Angle CBD} = \tan^{-1} \frac{3}{5} = 31^\circ$

c. $\text{Volume} = \frac{\pi r^2 h}{3} = \frac{\pi(3^2)(4)}{3} = 12\pi$

Chapter 8: Vectors transformation

8.1 Multiple choices

1. B
2. A
3. B
4. B
5. C
6. D
7. D
8. C
9. A

Chapter 9: Trigonometry

9.1 Multiple choices

1. C
2. A
3. D
4. C
5. B
6. C
7. A

8. C

9. B

10.C

11.B

12.A

13. A

14. A

9.2 Structured questions

1. Height of the tree = $150\text{m} \times \tan 30^\circ$
 $= 86.6\text{m}$

$$\begin{aligned} 2. LHS &= \frac{1}{\sin\theta} + \frac{1}{\cos\theta} \times \frac{\sin\theta}{\cos\theta} \\ &= \frac{1}{\sin\theta} + \frac{\sin\theta}{\cos^2\theta} \\ &= \frac{\cos^2\theta + \sin^2\theta}{\sin\theta\cos^2\theta} \\ &= \frac{1}{\sin\theta\cos^2\theta} \\ &= \frac{1}{\sin\theta} \frac{1}{\cos^2\theta} \end{aligned}$$

$$= \operatorname{Cosec} \theta \operatorname{Sec}^2 \theta$$

$$\therefore LHS = RHS$$

$$3. \text{ i. } \cos \theta = \sqrt{1 - \sin^2 \theta} = \sqrt{1 - \left(\frac{3}{5}\right)^2} = \sqrt{1 - \frac{9}{25}} = \sqrt{\frac{16}{25}} = \frac{4}{5}$$

$$\text{ii. } \sin 2\theta = 2 \sin \theta \cos \theta = 2 \left(\frac{3}{5}\right) \left(\frac{4}{5}\right) = \frac{24}{25}$$

4.

a) First, find $\cos A$ and $\sin B$

$$\sin^2 A + \cos^2 A = 1$$

$$\cos^2 A = 1 - \sin^2 A$$

$$= 1 - \left(\frac{1}{2}\right)^2$$

$$= 1 - \frac{1}{4}$$

$$= \frac{3}{4} \Rightarrow \cos A = \frac{\sqrt{3}}{2}$$

$$\sin^2 B + \cos^2 B = 1$$

Now

$$\sin^2 B = 1 - \cos^2 B$$

a) $\sin(A + B)$

$$= \sin A \cos B + \cos A \sin B$$

$$= \left(\frac{1}{2}\right) \left(\frac{\sqrt{3}}{2}\right) + \left(\frac{\sqrt{3}}{2}\right) \left(\frac{1}{2}\right)$$

$$= \frac{\sqrt{3}}{4} + \frac{\sqrt{3}}{4} = \frac{\sqrt{3}}{2}$$

b) $\cos(A + B)$ $= \frac{\sqrt{3}}{2} * \frac{\sqrt{3}}{2} - \frac{1}{2} * \frac{1}{2}$

$$= \frac{3}{4} - \frac{1}{4} = \frac{2}{4}$$

$$= \frac{1}{2}$$

$$= \frac{1}{4}$$

$$\sin B = \frac{1}{2}$$

5. a) $\cos 2x + \tan x \sin 2x = 1$

$$LHS = \cos 2x + \tan x \sin 2x$$

$$= 2\cos^2 x - 1 + \frac{\sin x}{\cos x} 2 \sin x \cos x$$

$$= 2\cos^2 x - 1 + 2\sin^2 x$$

$$= 2\cos^2 x + 2\sin^2 x - 1$$

$$= 2(\cos^2 x + \sin^2 x) - 1 \quad \text{but} \quad \cos^2 x + \sin^2 x = 1$$

$$= 2 - 1 = 1$$

$$\therefore LHS = RHS$$

$$b) \cos 2(15) + (\tan 15)(\sin 2(15)) = 1$$

$$\cos 30 + (\tan 15)(\sin 30) = 1$$

$$\frac{\sqrt{3}}{2} + \frac{1}{2} \tan 15 = 1$$

$$\sqrt{3} + \tan 15 = 2$$

$$\tan 15 = 2 - \sqrt{3}$$

$$6. \frac{b}{\sin B} = \frac{c}{\sin C}$$

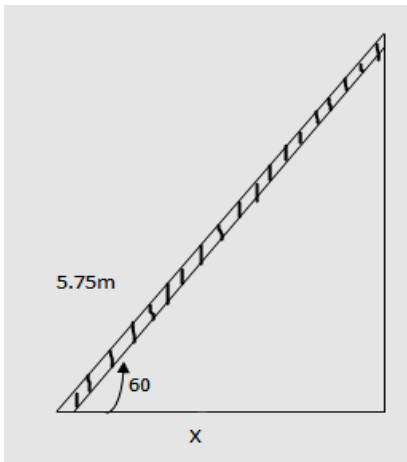
$$\sin C = \frac{c \sin B}{b}$$

$$\sin c = \frac{3x \sin 120}{5}$$

$$= \frac{3 \frac{\sqrt{3}}{2}}{5}$$

$$= \frac{3\sqrt{3}}{10}$$

7.



$$\text{adjacent} = \text{hypotenuse} \times \cos\theta$$

$$x = 5.75m \times \cos 60$$

$$x = 5.75 \times 0.5$$

$$x = 2.875m$$

8. let $y = \cos x$, thus

$$2y^2 + 3y + 1 = 0$$

$$2y^2 + 2y + y + 1 = 0$$

$$2y(y + 1) + 1(y + 1) = 0$$

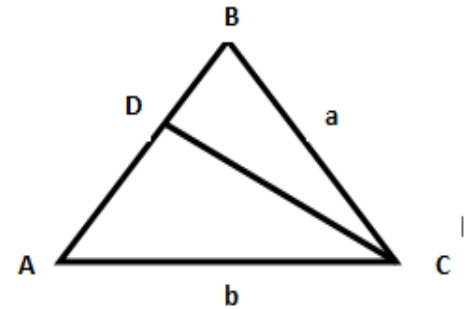
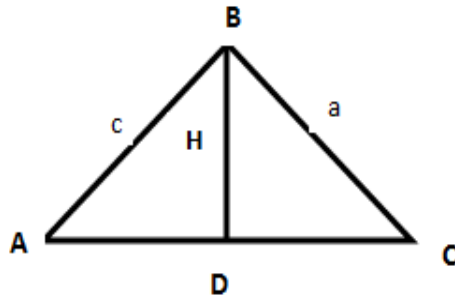
$$(2y + 1)(y + 1) = 0$$

$$y = -\frac{1}{2} \text{ or } y = -1$$

$$\therefore \cos x = -\frac{1}{2} \text{ or } \cos x = -1$$

thus, $x = 120^\circ, 180^\circ \text{ and } 240^\circ$

9.



In $\triangle ABD$, $h = c \sin A$ and also In $\triangle BCD$, $h = a \sin C$,

$$\therefore a \sin C = c \sin A$$

$$\frac{\sin A}{a} = \frac{\sin C}{c}$$

In $\triangle ACD$, $h = b \sin A$ and also In $\triangle BCD$, $h = a \sin B$ $\therefore a \sin B = b \sin A$

$$\frac{\sin A}{a} = \frac{\sin B}{b}$$

$$\therefore \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

10.

$$LHS = \frac{\tan^2 + 1}{\tan^2 \theta}$$

$$= \sec^2 \theta \div \frac{\sin^2 \theta}{\cos^2 \theta}$$

$$= \frac{1}{\cos^2 \theta} \times \frac{\cos^2 \theta}{\sin^2 \theta}$$

$$= \frac{1}{\sin^2 \theta}$$

$$\therefore LHS = RHS$$

11. $LHS = 1 + \tan^2 y$

$$= 1 + \frac{\sin^2 y}{\cos^2 y}$$

$$= \frac{\cos^2 y + \sin^2 y}{\cos^2 y}$$

$$= \frac{1}{\cos^2 y} = \sec^2 y$$

$$\therefore LHS = RHS$$

12.

a. First, find $\cos A$ and $\sin B$

$$\sin^2 A + \cos^2 A = 1$$

$$\cos^2 A = 1 - \sin^2 A$$

$$= 1 - \left(\frac{3}{5}\right)^2$$

$$= 1 - \frac{9}{25}$$

$$= \frac{16}{25} \Rightarrow \cos A = \frac{4}{5}$$

$$\sin^2 B + \cos^2 B = 1$$

$$\sin^2 B = 1 - \cos^2 B$$

Now

$$\mathbf{a) \cos(A + B) = \cos A \cos B + \sin A \sin B}$$

$$= \left(\frac{4}{5}\right) \left(\frac{12}{13}\right) + \left(\frac{3}{5}\right) \left(\frac{5}{13}\right)$$

$$= \frac{48}{65} + \frac{15}{65} = \frac{63}{65}$$

$$= 1 - \frac{144}{169}$$

$$= \frac{25}{169}$$

$$\sin B = \frac{5}{13}$$

$$\text{b. } LHS = \frac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1}$$

$$= \frac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1} * \frac{\sin\theta - \cos\theta + 1}{\sin\theta - \cos\theta + 1}$$

$$= \frac{2\sin\theta - 2\sin\theta\cos\theta + 2 - 2\cos\theta}{2\cos\theta - 2\cos^2\theta}$$

$$= \frac{2\sin\theta(1 - \cos\theta) + 2(1 - \cos\theta)}{2\cos\theta(1 - \cos\theta)}$$

$$= \frac{(1 - \cos\theta)(2\sin\theta + 2)}{2\cos\theta(1 - \cos\theta)}$$

$$= \frac{(2\sin\theta + 2)}{2\cos\theta}$$

$$= \frac{2(1 + \sin\theta)}{2\cos\theta}$$

$$= \frac{1 + \sin\theta}{\cos\theta}$$

$$\therefore LHS = RHS$$

13.

$$\text{i) } \cos x = \frac{12}{13}$$

$$\text{ii) } \tan x = \frac{5}{12}$$

$$14. \quad LHS = \cos 3A$$

$$= \cos(2A+A)$$

$$= \cos 2A \cos A - \sin 2A \sin A$$

$$= (2\cos^2 A - 1)\cos A - (2\sin A \cos A)\sin A$$

$$= 2\cos^3 A - \cos A - 2\cos A \sin^2 A$$

$$= 2\cos^3 A - \cos A - 2\cos A (1 - \cos^2 A)$$

$$= 2\cos^3 A - \cos A - 2\cos A + 2\cos^3 A$$

$$= 4\cos^3 A - 3\cos A$$

$$\therefore LHS = RHS$$

$$\begin{aligned}
 15. \quad LHS &= \frac{\tan^2 \theta + 1}{\tan^2 \theta} = \frac{\sec^2 \theta}{\tan^2 \theta} \\
 &= \frac{1}{\cos^2 \theta} \div \frac{\sin^2 \theta}{\cos^2 \theta} \\
 &= \frac{1}{\sin^2 \theta} \dots\dots\dots \text{But } \sin^2 \theta = 1 - \cos^2 \theta \\
 &= \frac{1}{1 - \cos^2 \theta}
 \end{aligned}$$

$$\therefore LHS = RHS$$

16.

$$\begin{aligned}
 LHS &= \frac{1}{\cos^2 \theta} \frac{1}{\sin^2 \theta} - \frac{\cos^2 \theta}{\sin^2 \theta} \\
 &= \frac{1 - \cos^2 \theta \cos^2 \theta}{\cos^2 \theta \sin^2 \theta} \\
 &= \frac{1 - \cos^4 \theta}{\cos^2 \theta \sin^2 \theta} \\
 &= \frac{(1 + \cos^2 \theta)(1 - \cos^2 \theta)}{\cos^2 \theta \sin^2 \theta} \\
 &= \frac{(1 + \cos^2 \theta) \sin^2 \theta}{\cos^2 \theta \sin^2 \theta} \\
 &= \frac{(1 + \cos^2 \theta)}{\cos^2 \theta}
 \end{aligned}$$

$$= 1 + \sec^2 \theta$$

$$\therefore LHS = RHS$$

17.

$$\text{a) L.H.S} = 1 + \tan^2 x = 1 + \frac{\sin^2 x}{\cos^2 x} \Rightarrow \frac{\cos^2 x + \sin^2 x}{\cos^2 x}$$

$$= \frac{1}{\cos^2 x} = \sec^2 x \therefore L.H.S = R.H.S$$

$$\text{b) L.H.S} = 1 + \frac{\cos^2 x}{\sin^2 x} = \frac{\sin^2 x + \cos^2 x}{\sin^2 x}$$

$$= \frac{1}{\sin^2 x}$$

$$= \csc^2 x$$

$$\therefore L.H.S = R.H.S$$

$$18. \text{ LHS} = \frac{\sin x}{1 + \cos x} + \frac{1 - \cos x}{\sin x}$$

$$= \frac{\sin^2 x + (1 - \cos^2 x)}{\sin x (1 + \cos x)}$$

$$= \frac{\sin^2 x + \sin^2 x}{\sin x(1 + \cos x)}$$

$$= \frac{2\sin^2 x}{\sin x(1 + \cos x)}$$

$$= \frac{2\sin x}{(1 + \cos x)}$$

$$\therefore LHS = RHS$$

$$19. \tan 15^\circ = \frac{y}{x+100} \dots \dots \dots (1)$$

$$\tan 30^\circ = \frac{y}{x} \dots \dots \dots (2)$$

$$Y = 0.267949192(x+100) \dots \dots \dots (1)$$

$$Y = 0.577350269x \dots \dots \dots (2)$$

$$0.267949192(x+100) = 0.577350269x$$

$$0.577350269x - 0.267949192x = 26.7949192$$

$$X = \frac{26.7949192}{0.309401077} = 86.6$$

$$Y = 0.577350269(86.6)$$

$$Y = 50$$

$$\sin 30 = \frac{y}{BA}$$

$$BA = (50)(0.5)$$

$$BA = 25\text{m}$$

10.1 Multiple choices

1. C

2. A

3. C

4. C

5. B

6. B

7. B

8. A

9. C

10. B

11. A

12. B

13. A

14. B

15. D

16. B

17. A

18..B

19. C

20. B

21. B

10.2 Structured questions

1. $m = \frac{dy}{dx} = 6x + 10$

$$m = 16$$

$$y - y_1 = m(x - x_1)$$

$$y - 18 = 16(x - 1)$$

$$y = 16x - 16 + 18$$

$$y = 16x + 2$$

The equation of the tangent is $y = 16x + 2$

2.

i) $v = 4t^2 - 5t + 2$

$$v = 4(5^2) - 5(5) + 2$$

$$v = 77 \text{ m/sec}$$

$$\text{ii) } a = 8t - 5$$

$$a = 8(0) - 5$$

$$a = -5 \text{ m/sec}^2$$

$$\begin{aligned} \text{iii) } s &= \int v dt = \int_0^3 (4t^2 - 5t + 2) dt - \int_0^2 (4t^2 - 5t + 2) dt = \\ &= \left[\frac{4t^3}{3} - \frac{5t^2}{2} + 2t \right]_0^3 - \left[\frac{4t^3}{3} - \frac{5t^2}{2} + 2t \right]_0^2 = \end{aligned}$$

$$= \left[\frac{4t^3}{3} - \frac{5t^2}{2} + 2t \right]_0^3 - \left[\frac{4t^3}{3} - \frac{5t^2}{2} + 2t \right]_0^2 =$$

$$= \frac{39}{2} - \frac{14}{3} = \frac{89}{6}$$

$$\therefore \text{the distance during the 3rd second is } \frac{89}{6} \text{ m}$$

3.

$$\text{i. } V = 3t^2 - 6t + 1$$

$$= 3(2)^2 - 6(2) + 1$$

$$= 1 \text{ m/s}$$

$$\text{ii. } V = 3t^2 - 6t + 1$$

$$3t^2 - 6t + 1 = 0$$

Using the quadratic formula we obtain $t = 1.8s$

iii. $a = 6t - 6$

$$= 6(3) - 6$$

$$= 12m/s^2$$

4. $\int_1^3 \left(\frac{x^4}{4} - x \right) = \left(\frac{3^4}{4} - 3 \right) - \left(\frac{1^4}{4} - 1 \right)$

$$= \left(\frac{81}{4} - 3 \right) - \left(\frac{1}{4} - 1 \right)$$

$$= \left(\frac{81 - 12}{4} \right) - \left(\frac{1 - 4}{4} \right)$$

$$= \frac{69}{4} + \frac{3}{4} \Rightarrow \frac{72}{4} = 18$$

5.

a) $V = 24t - 3t^2$ and $a = 24 - 6t$

b) $a = 24 - 6(2)$

$$a = 12m/s^2$$

6.

$$a) \frac{dy}{dx} = 3x^2 - 6x = 0$$

$$3x(x-2) = 0$$

$$\text{When } x = 0, \quad y = 0$$

$$\text{When } x = 2, \quad y = -4$$

$$X = 0 \text{ or } x = 2$$

The co-ordinates of the turning points are (0, 0) and (2, -4)

$$b) y'' = 6x - 6$$

$$\text{When } x = 0$$

$$y'' = 6(0) - 6$$

$$y'' = -6 \dots\dots\dots \text{maximum point}$$

$$\text{When } x = 2$$

$$y'' = 6(2) - 6$$

$$y'' = 6 \dots\dots\dots \text{minimum point}$$

7.

a) Point A is (0,8) and point B is (2, 4)

b) The intersection points are (2, 4) and (-2, 4)

$$\text{The shaded area} = \frac{1}{2} \int_{-2}^2 [(8 - x^2) - (x^2)] dx$$

$$= \frac{1}{2} \int_{-2}^2 (8 - 2x^2) dx$$

$$= \frac{1}{2} \left[8x - \frac{2x^3}{3} \right]_{-2}^2$$

$$= \frac{1}{2} \left[8(2) - \frac{2(2)^3}{3} \right] - \frac{1}{2} \left[8(-2) - \frac{2(-2)^3}{3} \right]$$

$$= \frac{32}{6} + \frac{32}{6}$$

$$= \frac{64}{4} \text{ sqrunit}$$

8. the slope of line l_2 is $\frac{3}{2}$, the slope of the perpendicular line l_1 is –

$$\frac{2}{3}$$

$\therefore$ the equation of the straight line l_1 passing through the point (3, 1) and

slope $-\frac{2}{3}$ is

$$y - 1 = -\frac{2}{3}(x - 3)$$

$$y - 1 = -\frac{2}{3}x + 2$$

$$y = -\frac{2}{3}x + 2$$

9.

$$\text{a) } m = \frac{dy}{dx} = 12x - 2$$

$$m = 12(3) - 2$$

$$m = 34$$

$$\text{b) at a minimum, } \frac{dy}{dx} = 0$$

$$12x - 2 = 0$$

$$x = \frac{2}{12} = \frac{1}{6}$$

by using $\frac{d^2y}{dx^2}$ test,

$$\frac{d^2y}{dx^2} = 12$$

since the value of $\frac{d^2y}{dx^2} > 0$ the point is minimum point

10.

a) First find the points of intersection

$$4 - x^2 = x^2 - 4 \Rightarrow x = \pm 2$$

$$A = \int_{-2}^2 [(4 - x^2) - (x^2 - 4)] dx$$

$$= \int_{-2}^2 (8 - 2x^2) dx = \left[8x - \frac{2x^3}{3} \right]_{-2}^2 =$$

$$= \left[8(2) - \frac{2(2)^3}{3} \right] - \left[8(-2) - \frac{2(-2)^3}{3} \right]$$

$$= \frac{64}{3} \text{ sq units}$$

$$\text{b) } \int x^2 \left(\sqrt[3]{(x^3 + 3)^{11}} \right) dx = \int x^2 (x^3 + 3)^{\frac{11}{3}} dx =$$

insert 3 and composite $\frac{1}{3}$

$$= \frac{1}{3} \int 3x^2(x^3 + 3)^{\frac{11}{3}} dx = \text{let } u = x^3 + 3 \text{ then } du = 3x^2 dx$$

$$= \frac{1}{3} \int u^{11/3} du = \frac{1}{3} \left(\frac{u^{14/3}}{14/3} \right) + c$$

$$= \frac{1}{3} \left(\frac{3u^{14/3}}{14} \right) + c$$

$$= \frac{1}{14} (u^{14/3}) + c$$

$$= \frac{1}{14} (x^3 + 3)^{14/3} + c$$

11.

a)

$$v = \frac{ds}{dt} = -23 + 244t - 3t^2$$

$$= -23 + 244(5) - 3(5)^2$$

$$= 1122m/s$$

b) $a = \frac{dv}{dt} = 244 - 6t$

$$= 244 - 6(2)$$

$$= 232m/sec^2$$

12.

$$\text{a) } \frac{dy}{dx} = 5x^4 + 3x^{1/2} + \frac{12}{x^4}$$

$$\text{b) } \frac{dy}{dx} = \frac{3(x^2-2)^{1/2} \cdot 2x}{2}$$

$$= 3x(x^2 - 2)^{1/2}$$

$$= 3x\sqrt{x^2 - 2}$$

13.

$$\text{a) } \frac{dy}{dx} \text{ is } 3x^2 - 12 \quad \text{find the value of } x$$

$$3x^2 - 12 = 0$$

$$\text{when } x = 2 \text{ then } y = -16$$

and

$$\text{when } x = -2 \text{ then } y = 16$$

$\therefore$ the coordinates of the stationary points on the curve

$$y = x^3 - 12x \text{ are } (2, -16) \text{ and } (-2, 16)$$

b) Using 2nd derivative test

$$\frac{d^2y}{dx^2} = 6x$$

$$\text{when } x = 2,$$

$$\frac{d^2y}{dx^2} = 12 > 0 \therefore p(2, -16) \text{ is a minimum point}$$

when $x = -2$,

$$\frac{d^2y}{dx^2} = -12 < 0 \therefore p(-2, 16) \text{ is a maximum point}$$

14.

$$\text{a) } v = at^2 - 4t + 3$$

$$v = a(0)^2 - 4(0) + 3$$

$$= 3 \text{ m/s}$$

$$\text{b) First find a, } a(1)^2 - 4(1) + 3 = 3 \therefore a = 4$$

$$s = \int_0^1 (4t^2 - 4t + 3) dx = \left[\frac{4t^3}{3} - 2t^2 + 3t \right]_0^1$$

$$= \frac{4(1)^3}{3} - 2(1)^2 + 3(1)$$

$$= \frac{7}{3} \text{ m}$$

$$\text{c) } a = \frac{dv}{dt} = 8t - 4$$

$$= 8\left(\frac{1}{2}\right) - 4$$

$$= 0$$

$$15. \int_0^5 (4x^3 - x^2 + 2x - 1) dx = x^4 - \frac{x^3}{3} + x^2 - x \Big|_0^5 =$$

16.

a. First find the slope

$$m = 15x^2 - 4x + 10 \text{ at } x = 1$$

$$= 15(1)^2 - 4(1) + 10$$

$$= 15 - 4 + 10 = 21$$

$$\therefore y - 10 = 21(x - 1)$$

$$y - 10 = 21x - 21$$

$$y = 21x - 11$$

17. First find the points of intersection

$$x^2 - 2x + 10 = x^2 + 2x + 10$$

$$x^2 + x^2 - 2x + 10 - 10 = 0$$

$$2x^2 - 4x = 0$$

$$2x(x - 2) = 0$$

$$x = 0 \text{ or } x = 2$$

$$\begin{aligned}A &= \int_0^2 (-x^2 + 2x + 10) \\&\quad - (x^2 - 2x + 10)dx \\&= \int_0^2 (-2x^2 + 4x)dx \\&= \left[\frac{-2x^3}{3} + 2x^2 \right]_0^2 \\&= \left(\frac{-2(2)^3}{3} + 2(2)^2 \right) - 0 \\&= \frac{-16}{3} + 8 = \frac{-16 + 24}{3} \\&= \frac{8}{3}\end{aligned}$$

18.

a)

$$\frac{dy}{dx} = 2x + 3$$

$$\int \frac{dy}{dx} = \int (2x + 3)dx$$

$$y = x^2 + 3x + c$$

$$9 = 1^2 + 3(1) + c \Rightarrow c = 5$$

The equation is $y = x^2 + 3x + 5$

b) $y = 4x^3 + x + 1$

$$m = \frac{dy}{dx} = 12x^2 + 1$$

$$m = 49$$

$$y = 4x^3 + x + 1$$

$$y = 4(2)^3 + 2 + 1$$

$$y = 35$$

∴ The equation of a tangent to the curve at p (2, 35) is

$$y - 35 = 49(x - 2)$$

$$y = 49x - 63$$

19.

a. $\frac{dy}{dx} = 3x^2 + 12x$

b. $3x^2 + 12x = 0$

$$3x(x + 4) = 0$$

$$x = 0 \text{ and } x = -4$$

The coordinates of the turning points are (0,-16) and (-4,16).

c. Using the second derivative test we obtain

When $x = 0$

$$\frac{d^2y}{dx} = 6x + 12$$

$$= 6(0) + 12 = 12 > 0$$

.....minimum point

When $x = -4$

$$\frac{d^2y}{dx} = 6x + 12$$

$$6(-4) + 12 = -12 < 0 \text{ maximum point}$$

20.

$$\int_2^3 (3x^2 - 4x + 5) dx$$

$$= [x^3 - 2x^2 + 5x]_2^3$$

$$= [3^3 - 2(3^2) + 5(3)] - [2^3 - 2(2^2) + 5(2)]$$

$$= 24 - 10$$

$$= 14$$

i. $a = 10 - 3t$

When $t = 2s$

$$a = 4m/s^2$$

ii. $v = \int (10 - 3t) dt$

$$v = 10t - \frac{3}{2}t^2$$

When $t = 2s$

$$v = 10(2) - \frac{3}{2}(2)^2$$

$$v = 14m/s$$

21.

$$-2x + 4 = 0$$

$$x = 2$$

$$y = -(2)^2 + 4(2) + 1$$

$$y = 5$$

The coordinates of the turning point are (2,5)

22. The slope of the line whose equation is $5x + 3y = 8$ is $-\frac{5}{3}$.

Therefore the slope (gradient) of the perpendicular line is $\frac{3}{5}$

$$23. \quad A = \int_1^3 (x^2 + 1) dx = \int_1^3 \left(\frac{x^3}{3} + x\right)$$

$$A = \left(\frac{3^3}{3} + 3\right) - \left(\frac{1^3}{3} + 1\right) \Rightarrow 12 - \left(\frac{1+3}{3}\right) = 12 - \frac{4}{3} = \frac{32}{3}$$

24.

$$\text{a) } V = 6t^2 + 8t - 8$$

$$= 6(2)^2 + 8(2) - 8$$

$$= 24 + 16 - 8$$

$$= 32m/s$$

$$\text{b) } a = \frac{dv}{dt} = 12t + 8$$

$$a = 12(3) + 8$$

$$a = 36 + 8$$

$$a = 44m/s^2$$

$$\text{c) } 6t^2 + 8t - 8 = 0$$

$$3t^2 + 4t - 4 = 0$$

$$3t^2 + 6t - 2t - 4 = 0$$

$$3t(t + 2) - 2(t + 2) = 0$$

$$(3t - 2)(t + 2) = 0$$

$$3t - 2 = 0 \quad \text{or} \quad t + 2$$

26.

$$A = \int_0^3 (x^2 + 3x + 2) dx$$

$$= \left[\frac{x^3}{3} + \frac{3x^2}{2} + 2x \right]_0^3$$

$$= \left[\frac{(3)^3}{3} + \frac{3(3)^2}{2} + 2(3) \right]$$

$$= \frac{57}{2} \text{sq units}$$

THE END