Sample Question Paper - 2
Class- X Session- 2021-22 TERM 1
Subject- Mathematics (Basic)

Time Allowed: 1 hour and 30 minutes **Maximum Marks: 40**

General Instructions:

1. The question paper contains three parts A, B and C.
2. Section A consists of 20 questions of 1 mark each. Attempt any 16 questions.
3. Section B consists of 20 questions of 1 mark each. Attempt any 16 questions.
4. Section C consists of 10 questions based on two Case Studies. Attempt any 8 questions.
5. There is no negative marking.

Section A

Attempt any 16 questions

1. Let $\frac{p}{q}$ be a rational number. Then, the condition on q such that $\frac{p}{q}$ has a non-terminating but repeating decimal expansion is: **[1]**

a) $q = 2^m \times 5^n$; m, n are whole numbers
b) $q \neq 2^m \times 3^n$; m, n are whole numbers
c) $q = 2^m \times 3^n$; m, n are whole numbers
d) $q \neq 2^m \times 5^n$; m, n are whole numbers

2. The system of equations 2x + 3y - 7 = 0 and 6x + 5y - 11 = 0 has **[1]**

a) unique solution
b) infinite many solutions
c) no solution
d) non zero solution

3. If x - 2 is a factor of the polynomial $3x^3 - 7x^2 + kx - 16$, then the value of k is **[1]**

a) -10
b) 10
c) -2
d) 2

4. If 4x + 6y = 3xy and 8x + 9y = 5xy then **[1]**

a) x = 3, y = 4
b) x = 2, y = 3
c) x = 1, y = 2
d) x = 1, y = -1

5. If $4\ tan\ \theta = 3$, then $\frac{4\sin\theta - \cos\theta}{4\sin\theta + \cos\theta}$ is equal to **[1]**

a) $\frac{2}{3}$
b) $\frac{3}{4}$
c) $\frac{1}{3}$
d) $\frac{1}{2}$

6. Which of the following is a pair of co-primes? **[1]**

a) (14, 35)
b) (18, 25)

c) (32, 62)	d) (31, 93)

7. A polynomial of degree n has **[1]**

a) one zero
b) n zeroes
c) at most n zeroes
d) at least n zeroes

8. If A(1, 3), B(-1, 2), C(2, 5) and D(x, 4) are the vertices of a ||gm ABCD then the value of x is **[1]**

a) 0
b) 3
c) $\frac{3}{2}$
d) 4

9. If one root of the polynomial f(x) = $5x^2 + 13x + k$ is reciprocal of the other, then the value of k is **[1]**

a) 5
b) 0
c) $\frac{1}{6}$
d) 6

10. The quadratic polynomial, the sum of whose zeroes is -5 and their product is 6, is: **[1]**

a) $x^2 + 5x + 6$
b) $x^2 - 5x - 6$
c) $-x^2 + 5x + 6$
d) $x^2 - 5x + 6$

11. A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball is double that of a red ball, then the number of blue balls is **[1]**

a) 8
b) 10
c) 5
d) 12

12. $x^2 + 2x + 1 = 0$: Discriminant of the given equation is ________ **[1]**

a) 1
b) 0
c) 2
d) 4

13. Two vertices of △ABC are A (-1, 4) and B(5, 2) and its centroid is G(0, -3). Then, the coordinates of C are **[1]**

a) (4, 3)
b) (4, 15)
c) (-4, -15)
d) (-15, -4)

14. The line segment joining points (-3, -4) and (1, -2) is divided by y-axis in the ratio **[1]**

a) 1:3
b) 2:3
c) 3:2
d) 3:1

15. Given that one of the zeroes of the quadratic polynomial $ax^2 + bx + c$ is zero, then the other zero is **[1]**

a) $\frac{-b}{a}$
b) $\frac{c}{a}$
c) $\frac{-c}{a}$
d) $\frac{b}{a}$

16. $(\sec\theta + \cos\theta)(\sec\theta - \cos\theta) =$ **[1]**

a) $\tan^2\theta + \cos^2\theta$
b) $\tan^2\theta - \cos^2\theta$

c) $\tan^2\theta + \sin^2\theta$

d) $\tan^2\theta - \sin^2\theta$

17. In $\triangle ABC$, if $\angle C = 3\angle B = 2(\angle A + \angle B)$, then $\angle C$ = **[1]**

a) 90^o

b) 150^o

c) 120^o

d) 60^o

18. A letter of English alphabets is chosen at random. The probability that the letter chosen is a consonant is **[1]**

a) $\frac{2}{26}$

b) $\frac{1}{26}$

c) $\frac{21}{26}$

d) $\frac{5}{26}$

19. The HCF of 135 and 225 is: **[1]**

a) 5

b) 15

c) 45

d) 75

20. The perimeter of the triangle formed by the points (0, 0), (1, 0) and (0, 1) is **[1]**

a) $2 + \sqrt{2}$

b) 3

c) $\sqrt{2} + 1$

d) $1 \pm \sqrt{2}$

Section B

Attempt any 16 questions

21. If the system of equations **[1]**

2x + 3y = 5,

4x + ky = 10

has infinitely many solutions, then k =

a) 3

b) 1

c) 6

d) $\frac{1}{2}$

22. The sum and product of the zeroes of the polynomial $f(x) = 4x^2 - 27x + 3k^2$ are equal, then the value of k is **[1]**

a) ± 3

b) 0

c) ± 1

d) ± 2

23. The LCM of two numbers is 1200. Which of the following cannot be their HCF? **[1]**

a) 500

b) 200

c) 600

d) 400

24. The value of $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}}$ is **[1]**

a) $\operatorname{cosec}^2\theta + \cot^2\theta$

b) $\cot\theta - \operatorname{cosec}\theta$

c) $\operatorname{cosec}\theta + \cot\theta$

d) $(\cot\theta + \operatorname{cosec}\theta)^2$

25. A system of linear equations is said to be inconsistent if it has **[1]**

a) one solution

b) at least one solution

c) two solutions

d) no solution

26. If -2 and 3 are the zeros of the quadratic polynomial $x^2 + (a + 1)x + b$ then **[1]**

a) a = 2, b = 6
b) a = 2, b = -6
c) a = -2, b = -6
d) a = -2, b = 6

27. In $\triangle$ABC, AB = 6 $\sqrt{3}$ cm, AC = 12 cm and BC = 6 cm. Then, $\angle \mathbf{B}$ is **[1]**

a) 120°
b) 45°
c) 90°
d) 60°

28. The coordinates of the circumcentre of the triangle formed by the points O(0, 0) , A(a, 0) and B(0, b) are **[1]**

a) $\left(\frac{b}{2}, \frac{a}{2}\right)$
b) $\left(\frac{a}{2}, \frac{b}{2}\right)$
c) (b, a)
d) (a, b)

29. If $\tan\theta = \frac{a}{b}$, then $\frac{a\sin\theta + b\cos\theta}{a\sin\theta - b\cos\theta}$ is **[1]**

a) $\frac{a+b}{a-b}$
b) $\frac{a^2-b^2}{a^2+b^2}$
c) $\frac{a-b}{a+b}$
d) $\frac{a^2+b^2}{a^2-b^2}$

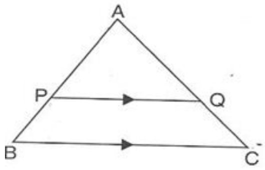
30. The graphic representation of the equations x + 2y = 3 and 2x + 4y + 7 = 0 gives a pair of **[1]**

a) parallel lines
b) none of these
c) coincident lines
d) intersecting lines

31. The LCM of $2^3 \times 3^2$ and $2^2 \times 3^3$ **[1]**

a) 2×3^2
b) $2^3 \times 3^3$
c) $2^2 \times 3^2$
d) $2^2 \times 3$

32. In the given figure $PQ || BC$. $\frac{AP}{PB} = 4$, then the value of $\frac{AQ}{AC}$ is **[1]**



a) 5
b) $\frac{4}{5}$
c) 4
d) $\frac{5}{4}$

33. $\frac{2\tan 30^\circ}{1+\tan^2 30^\circ}$ = **[1]**

a) $\cos 60^o$
b) $\sin 60^o$
c) sin 30°
d) $\tan 60^o$

34. The point on the x-axis which is equidistant from points (-1, 0) and (5, 0) is **[1]**

a) (0, 3)
b) (2, 0)
c) (3, 0)
d) (0, 2)

35. A card is drawn at random from a pack of 52 cards. The probability that the card is drawn is neither an ace nor a king is **[1]**

a) $\frac{11}{26}$

b) $\frac{11}{13}$

c) $\frac{1}{26}$

d) $\frac{4}{13}$

36. The value of k for which the system of equations **[1]**

2x + 3y = 5 and

4x + ky = 10

has infinite number of solutions, is

a) 1

b) 6

c) 0

d) 3

37. HCF of $(2^3 \times 3^2 \times 5)$, $(2^2 \times 3^3 \times 5^2)$ and $(2^4 \times 3 \times 5^3 \times 7)$ is **[1]**

a) 60

b) 48

c) 30

d) 105

38. The value of tan $1^\circ\ tan\ 2^\circ tan\ 3^\circ \ldots\ldots\ldots\ldots\ tan\ 89^\circ$ is **[1]**

a) $\frac{1}{2}$

b) 1

c) None of these

d) 0

39. The probability of getting 2 heads, when two coins are tossed, is **[1]**

a) $\frac{1}{4}$

b) 1

c) $\frac{1}{2}$

d) $\frac{3}{4}$

40. A circle drawn with origin as the centre passes through $(\frac{13}{2}, 0)$. The point which does not lie in the interior of the circle is **[1]**

a) $\frac{-3}{4}, 1$

b) $2, \frac{7}{3}$

c) $5, \frac{-1}{2}$

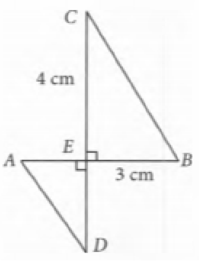
d) $\left(-6, \frac{5}{2}\right)$

Section C

Attempt any 8 questions

Question No. 41 to 45 are based on the given text. Read the text carefully and answer the questions:

Shalini wants to make a toran for Diwali using some pieces of cardboard. She cut some cardboard pieces as shown below. If perimeter of ΔADE and ΔBCE are in the ratio 2 : 3, then answer the following questions.



41. If the two triangles here are similar by SAS similarity rule, then their corresponding proportional sides are **[1]**

a) $\frac{BE}{AE} = \frac{CE}{DE}$

b) None of these

c) $\frac{AD}{CE} = \frac{BE}{DE}$

d) $\frac{AE}{CE} = \frac{DE}{BE}$

42. Length of BC = **[1]**

a) None of these

b) 5 cm

c) 4 cm

d) 2 cm

43. Length of AD = **[1]**

a) $\frac{10}{3}$ cm

b) $\frac{9}{4}$ cm

c) $\frac{5}{3}$ cm

d) $\frac{4}{3}$ cm

44. Length of ED = **[1]**

a) Can't be determined

b) $\frac{4}{3}$ cm

c) $\frac{8}{3}$ cm

d) $\frac{7}{3}$ cm

45. Length of AE = **[1]**

a) $\frac{2}{3} \times \sqrt{BC^2 - CE^2}$

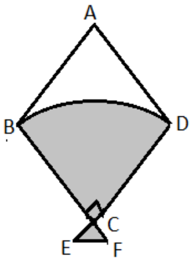
b) $\sqrt{AD^2 - DE^2}$

c) $\frac{2}{3} \times BE$

d) All of these

Question No. 46 to 50 are based on the given text. Read the text carefully and answer the questions:

Makar Sankranti is a fun and delightful occasion. Like many other festivals, the kite flying competition also has a historical and cultural significance attached to it. The following figure shows a kite in which BCD is the shape of quadrant of a circle of radius 42 cm, ABCD is a square and ACEF is an isosceles right angled triangle whose equal sides are 7 cm long.



46. Area of the shaded portion is **[1]**

a) 1390 cm^2

b) 1400 cm^2

c) 1410.5 cm^2

d) 1377 cm^2

47. Area of the unshaded portion is **[1]**

a) 380 cm^2

b) 378 cm^2

c) 384 cm^2

d) 370 cm^2

48. Find the area of the square. **[1]**

a) 1864 cm^2

b) 1700 cm^2

c) 1764 cm^2

d) 1800 cm^2

49. Area of quadrant BCD is **[1]**

a) $1386\ cm^2$

b) $1390\ cm^2$

c) $1290\ cm^2$

d) $1380\ cm^2$

50. Find the area of ACEF. **[1]**

a) $25.5\ cm^2$

b) $26\ cm^2$

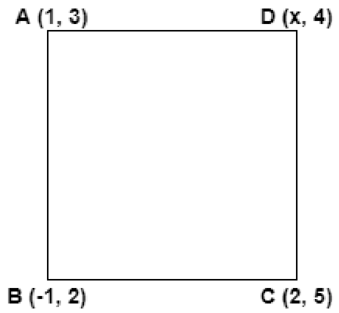
c) $24.5\ cm^2$

d) $25\ cm^2$

Solution

Section A

1. **(d)** q $\neq 2^m \times 5^n$; m, n are whole numbers
   Explanation: $\frac{p}{q}$ has a non-terminating but repeating decimal expansion if q $\neq 2^m \times 5^n$; m, n are whole numbers
2. **(a)** unique solution
   Explanation: 2x + 3y - 7 = 0
   6x + 5y - 11 = 0
   By Comparing with $a_1x + b_1y + c = 0$ and $a_2x + b_2y + c = 0$,
   Here, $a_1 = 2$, $b_1 = 3$, $c_1 = -7$, and $a_2 = 6$, $b_2 = 5$, $c_2 = -11$
   $\frac{a_1}{a_2} = \frac{2}{6} = \frac{1}{3}$
   $\frac{b_1}{b_2} = \frac{3}{5}$
   Since $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$
   Therefore, the system of equations has a unique solution.
3. **(b)** 10
   Explanation: If the polynomial $3x^3 - 7x^2 + kx - 16$ is exactly divisible by x - 2, then
   p(2) = 0
   $\Rightarrow 3(2)^3 - 7(2)^2 + k \times 2 - 16$
   $\Rightarrow$ 24 - 28 + 2k - 16 = 0
   $\Rightarrow$ -20 + 2k = 0
   $\Rightarrow$ k = 10
4. **(a)** x = 3, y = 4
   Explanation: Divide throughout by xy and put $\frac{1}{x} = u$ and $\frac{1}{y} = v$ to get
   4v + 6u = 3 ......(i)
   and 8v + 9u = 5 .....(ii)
   This gives u = $\frac{1}{3}$ and v = $\frac{1}{4}$. Hence, x = 3 and y = 4.
5. **(d)** $\frac{1}{2}$
   Explanation: Given" $4\tan\theta = 3$
   Dividing all terms of $\frac{4\sin\theta - \cos\theta}{4\sin\theta + \cos\theta}$ by $\cos\theta$,
   = $\frac{4\tan\theta - 1}{4\tan\theta + 1}$ = $\frac{3-1}{3+1} = \frac{2}{4} = \frac{1}{2}$
6. **(b)** (18, 25)
   Explanation: The numbers that do not share any common factor other than 1 are called co-primes.
   factors of 18 are: 1, 2, 3, 6, 9 and 18
   factors of 25 are: 1, 5, 25
   The two numbers do not share any common factor other than 1.
   They are co-primes to each other.
7. **(c)** at most n zeroes
   Explanation: A polynomial of degree n has at most n zeroes because the degree of a polynomial is equal to the zeroes of that polynomial only.
8. **(d)** 4
   Explanation:



Since ABCD is a ||gm, the diagonals bisect eachother. so
M is the mid- point of BD as well as AC.
$\frac{1+2}{2} = \frac{x-1}{2}$
1 + 2 = $x - 1$
$x = 4$

9. **(a)** 5
Explanation: The Given polynomial is $f(x) = 5x^2 + 13x + k$.
Product of roots = k/5
$1 = \frac{k}{5}$
$\Rightarrow$ k = 5

10. **(a)** $x^2 + 5x + 6$
Explanation: The quadratic polynomial when the sum of zeros and product of zeros is given:
=x^2 - (sum of zeros)x + product of zeros
= x^2 - (-5)x + 6
=x^2 + 5x + 6

11. **(b)** 10
Explanation: Let the number of blue balls be x.
$\therefore$ Number of total outcomes = 5 + x
Now, P (getting the red ball) = $\frac{5}{5+x}$
$\therefore$ P (getting blue ball) = $2\left(\frac{5}{5+x}\right)$
Also P (getting the blue ball) = $\frac{x}{x+5}$
$\therefore 2\left(\frac{5}{x+5}\right) = \frac{x}{x+5}$
$\Rightarrow$ x = 10

12. **(b)** 0
Explanation: D = b^2 - 4ac
D = 2^2 - 4 $\times$ 1 $\times$ 1
D = 4 - 4
D = 0

13. **(c)** (-4, -15)
Explanation: Let the vertex C be C (x,y). Then
$\frac{-1+5+x}{1} = 0$ and $\frac{4+2+y}{3} = -3 \Rightarrow x + 4 = 0$ and $6 + y = -9$
$\therefore \quad x = -4$ and $y = -15$
so, the coordinates of C are (-4, -15).

14. **(d)** 3:1
Explanation: The point lies on y-axis
Its abscissa will be zero
Let the point divides the line segment joining the points (-3, -4) and (1, -2) in the ratio m:n
$\therefore 0 = \frac{mx_2+nx_1}{m+n} \Rightarrow 0 = \frac{m\times 1+n\times(-3)}{m+n}$
$\Rightarrow \frac{m-3n}{m+n} = 0 \Rightarrow m - 3n = 0$

$\Rightarrow m = 3n \Rightarrow \frac{m}{n} = \frac{3}{1}$

∴ Ratio = 3:1

15. **(a)** $\frac{-b}{a}$

Explanation: Let $\alpha,\ \beta$ are the zeroes of the given polynomial.

Given: $\alpha = 0 \therefore \alpha + \beta = \frac{-b}{a} \Rightarrow 0 + \beta = \frac{-b}{a} \Rightarrow \beta = \frac{-b}{a}$

Therefore the other zero is $\frac{-b}{a}$.

16. **(c)** $\tan^2\theta + \sin^2\theta$

Explanation: Given: $(\sec\theta + \cos\theta)(\sec\theta - \cos\theta)$

$= (\sec^2\theta - \cos^2\theta)$

$= (1 + \tan^2\theta - 1 + \sin^2\theta)$

$= (\tan^2\theta + \sin^2\theta)$

17. **(c)** 120^o

Explanation: Since $\angle A + \angle B + \angle C = 180^o$ ... (i)

$\angle C = 3\angle B = 2(\angle A + \angle B)$

$3\angle B = 2(\angle A + \angle B)$

$3\angle B - 2\angle B = 2\angle A$

$\angle B = 2\angle A$

$\angle A = \angle \frac{B}{2}$

from (i),

$\angle \frac{B}{2} + \angle B + 3\angle B = 180^o$

$9\angle \frac{B}{2} = 180^o$

$\angle B = 40^o$

$\angle C = 3\angle B$

$\angle C = 3 \times 40 = 120^o$

18. **(c)** $\frac{21}{26}$

Explanation: We have,

Number of vowels = 5 (a, e, i, o, u)

Number of consonants = 21 (26 - 5 = 21)

Number of possible outcomes = 21

Number of total outcomes = 26

∴ Required Probability = $\frac{21}{26}$

19. **(c)** 45

Explanation: We have,

$135 = 3 \times 45$

$= 3 \times 3 \times 15$

$= 3 \times 3 \times 3 \times 5$

$= 3^3 \times 5$

Now, for 225 will be

$225 = 3 \times 75$

$= 3 \times 3 \times 5 \times 5$

$= 3^2 \times 5^2$

The HCF will be $3^2 \times 5 = 45$

20. **(a)** $2 + \sqrt{2}$

Explanation: Let the vertices of $\triangle ABC$ be A(0, 0), B(1, 0) and C(0, 1)

Now length of AB $= \sqrt{(1-0)^2 + (0-0)^2}$

$= \sqrt{(1)^2 + 0^2} = \sqrt{1^2} = 1$

Length of AC $= \sqrt{(0-0)^2+(1-0)^2} = \sqrt{0^2+(1)^2}$
$= \sqrt{1^2} = 1$
and length of BC $= \sqrt{(0-1)^2+(1-0)^2}$
$= \sqrt{(1)^2+(1)^2} = \sqrt{1+1} = \sqrt{2}$
Perimeter of $\triangle ABC$ = Sum of sides
$= 1+1+\sqrt{2} = 2+\sqrt{2}$

Section B

21. **(c)** 6
Explanation: The given system of equations
2x + 3y = 5
4x + ky = 10
$\frac{a_1}{a_2} = \frac{2}{4}, \frac{b_1}{b_2} = \frac{3}{k}, \frac{c_1}{c_2} = \frac{5}{10}$
For the equations to have infinite number of solutions
$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$
$i.e, \frac{2}{4} = \frac{3}{k} = \frac{5}{10}$
If we take
$\frac{2}{4} = \frac{3}{k}$
$\Rightarrow$ 2k = 12
$\Rightarrow k = \frac{12}{2}$
$\Rightarrow$ k = 6

22. **(a)** ± 3
Explanation: Let $\alpha,\ \beta$ are the zeroes of the given polynomial.
Given: $\alpha + \beta = \alpha\beta$
$\Rightarrow \frac{-b}{a} = \frac{c}{a}$
$\Rightarrow$ -b = -c
$\Rightarrow$ -(-27) = 3k^2
$\Rightarrow$ k^2 = 9
$\Rightarrow$ k = ± 3

23. **(a)** 500
Explanation: It is given that the LCM of two numbers is 1200 .
We know that the HCF of two numbers is always the factor of LCM.
500 is not the factor of 1200.
So this cannot be the HCF.

24. **(c)** cosec θ + cot θ
Explanation: $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \sqrt{\frac{(1+\cos\theta)(1+\cos\theta)}{(1-\cos\theta)(1+\cos\theta)}}$
$= \sqrt{\frac{(1+\cos\theta)^2}{1-\cos^2\theta}} = \sqrt{\frac{(1+\cos\theta)^2}{\sin^2\theta}}$
$= \frac{1+\cos\theta}{\sin\theta} = cosec\theta + \cot\theta$

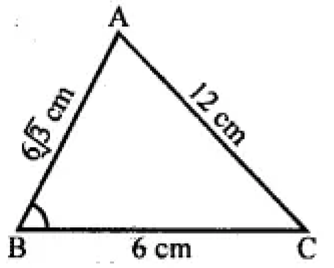
25. **(d)** no solution
Explanation: A system of linear equations is said to be inconsistent if it has no solution means two lines are running parallel and not cutting each other at any point.

26. **(c)** a = -2, b = -6
Explanation: $\alpha + \beta = 3 + (-2) = 1$ and $\alpha\beta = 3 \times (-2) = -6$
$\therefore$ -(a + 1) = 1
$\Rightarrow$ a + 1 = -1 $\Rightarrow$ a = -2
Also, b = -6

27. **(c)** 90°

Explanation:

In $\triangle ABC$, AB = 6 cm, AC = 12 cm and BC = 6 cm.



Longest side $(AC)^2 = (12)^2 = 144$

$AB^2 + BC^2 = (6\sqrt{3})^2 + (6)^2 = 108 + 36 = 144$

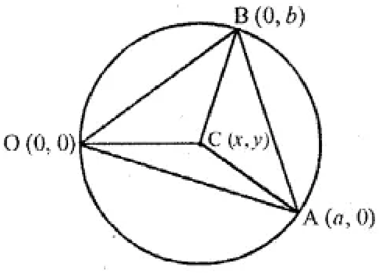
$AC^2 = AB^2 + BC^2$ (Converse of Pythagoras Theorem)

$\angle B = 90°$

28. **(b)** $\left(\frac{a}{2}, \frac{b}{2}\right)$

Explanation: Let co-ordinates of C be (x, y) which is the centre of the circumcircle of $\triangle OAB$

Radius of a circle are equal



$\therefore OC = CA = CB \Rightarrow OC^2 = CA^2 = CB^2$

$\therefore (x - 0)^2 + (y - 0)^2 = (x - a)^2 + (y - 0)^2$

$\Rightarrow x^2 + y^2 = (x - a)^2 + y^2$

$\Rightarrow x^2 = (x - a)^2 \Rightarrow x^2 = x^2 + a^2 - 2ax$

$a^2 - 2ax = 0 \Rightarrow a(a - 2x) = 0$

$\Rightarrow a = 2x \Rightarrow x = \frac{a}{2}$

and $(x - 0)^2 + (y - 0)^2 = (x - 0)^2 + (y - b)^2$

$x^2 + y^2 = x^2 + y^2 - 2by + b^2$

$\Rightarrow 2by = b^2 \Rightarrow y = \frac{b}{2}$

$\therefore$ Co-ordinates of circumcentre are $\left(\frac{a}{2}, \frac{b}{2}\right)$

29. **(d)** $\frac{a^2+b^2}{a^2-b^2}$

Explanation: $\tan\theta = \frac{a}{b}$

$\frac{a\sin\theta+b\cos\theta}{a\sin\theta-b\cos\theta} = \frac{a\frac{\sin\theta}{\cos\theta}+b\frac{\cos\theta}{\cos\theta}}{a\frac{\sin\theta}{\cos\theta}-b\frac{\cos\theta}{\cos\theta}}$ (Dividing by $\cos\theta$)

$= \frac{a\tan\theta+b}{a\tan\theta-b} = \frac{a\times\frac{a}{b}+b}{a\times\frac{a}{b}-b}$

$= \frac{\frac{a^2}{b}+b}{\frac{a^2}{b}-b} = \frac{\frac{a^2+b^2}{b}}{\frac{a^2-b^2}{b}}$

$= \frac{a^2+b^2}{b} \times \frac{b}{a^2-b^2}$

$= \frac{a^2+b^2}{a^2-b^2}$

30. **(a)** parallel lines

Explanation: Given: Two equations, x + 2y = 3

$\Rightarrow x + 2y - 3 = 0$ .... (i)
$2x + 4y + 7 = 0$ .... (ii)
We know that the general form for a pair of linear equations in 2 variables x and y is $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$.
Comparing with above equations,
we have $a_1 = 1, b_1 = 2, c_1 = -3; a_2 = 2, b_2 = 4, c_2 = 7$
$\frac{a_1}{a_2} = \frac{1}{2}; \frac{b_1}{b_2} = \frac{2}{4} = \frac{1}{2}; \frac{c_1}{c_2} = \frac{-3}{7}$
Since $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$
$\therefore$Both lines are parallel to each other.

31. **(b)** $2^3 \times 3^3$
Explanation: L.C.M. of $2^3 \times 3^2$ and $2^2 \times 3^3$ is the product of all prime numbers with the greatest power of every given number, hence it will be $2^3 \times 3^3$

32. **(b)** $\frac{4}{5}$
Explanation: Given: $\frac{\text{AP}}{\text{PB}} = \frac{4}{1}$
Let AP = 4x and PB = x, then AB = AP + PB = 4x + x = 5x
Since PQ$\|$BC, then
$\frac{\text{AP}}{\text{AB}} = \frac{\text{AQ}}{\text{AC}}$ [Using Thales theorem]
$\therefore \frac{\text{AQ}}{\text{AC}} = \frac{\text{AP}}{\text{AB}} = \frac{4x}{5x} = \frac{4}{5}$

33. **(b)** sin 60^o
Explanation: $\frac{2tan30^o}{1+tan^2 30^o} = \frac{2\times\frac{1}{\sqrt{3}}}{1+(\frac{1}{\sqrt{3}})^2}$
$\frac{\frac{2}{\sqrt{3}}}{1+\frac{1}{3}} = \frac{\frac{2}{\sqrt{3}}}{\frac{4}{3}} = \frac{2}{\sqrt{3}} \times \frac{3}{4} = \frac{\sqrt{3}}{2}$
= $\sin 60^o$

34. **(b)** (2, 0)
Explanation: Let the required point be P(x, 0). Then,
$PA^2 = PB^2 \Rightarrow (x+1)^2 = (x-5)^2$
$\Rightarrow x^2 + 2x + 1 = x^2 - 10x + 25$
$\Rightarrow 12x = 24 \Rightarrow x = 2$
So, the required point is P(2, 0).

35. **(b)** $\frac{11}{13}$
Explanation: Total number of outcomes = 52
Favourable outcomes in this case = 52 – {4 + 4} = 44 [52 - {4 aces + 4 kings}]
$\therefore$ P(neither an ace nor a king) = $\frac{Favourable\ outcomes}{Total\ outcomes} = \frac{44}{52} = \frac{11}{13}$

36. **(b)** 6
Explanation: The given system of equations are
$2x + 3y = 5$
$4x + ky = 10$
For the equations to have infinite number of solutions, $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$
Here, we must have
Therefore $\frac{2}{4} = \frac{3}{k} = \frac{5}{10}$
$\Rightarrow \frac{2}{4} = \frac{3}{k}$
$\Rightarrow 2k = 12$
$\Rightarrow k = \frac{12}{2}$
$\Rightarrow k = 6$

37. **(a)** 60

Explanation: HCF = $(2^3 \times 3^2 \times 5, 2^2 \times 3^3 \times 5^2,\ 2^4 \times 3 \times 5^3 \times 7)$

HCF = Product of smallest power of each common prime factor in the numbers

= $2^2 \times 3 \times 5$ = 60

38. **(b)** 1

Explanation: $tan\ 1^\circ tan\ 2^\circ tan\ 3^\circ \ldots\ldots\ldots\ldots\ tan\ 89^\circ$

= $\tan(90^\circ - 89^\circ)\tan(90^\circ - 88^\circ)\tan(90^\circ - 87^\circ)\ldots\ldots\ldots\tan 87^\circ \tan 88^\circ \tan 89^\circ$

= $\cot 89^\circ \cot 88^\circ \cot 87^\circ \ldots\ldots\ldots \tan 87^\circ \tan 88^\circ \tan 89^\circ$

= $(\cot 89^\circ \tan 89^\circ)(\cot 88^\circ \tan 88^\circ)(\cot 87^\circ \tan 87^\circ)\ldots..(\cot 44^\circ \tan 44^\circ)\tan 45^\circ$

= $1 \times 1 \times 1 \times 1 \times 1$ .... 1 = 1

39. **(a)** $\frac{1}{4}$

Explanation: All possible outcomes are HH, HT, TH, TT. Their number is 4.

Getting 2 heads, means getting HH. Its number is 1.

$\therefore$ P(getting 2 heads) = $\frac{1}{4}$

40. **(d)** $\left(-6, \frac{5}{2}\right)$

Explanation: Distance between (0, 0) and $\left(-6, \frac{5}{2}\right)$

d = $\sqrt{(-6-0)^2 + \left(\frac{5}{2} - 0\right)^2}$

= $\sqrt{36 + \frac{25}{4}}$

= $\sqrt{\frac{144+25}{4}}$

= $\sqrt{\frac{169}{4}} = \frac{13}{2}$ = 6.5

So, the point $\left(-6, \frac{5}{2}\right)$ does not lie in the circle.

Section C

41. **(a)** $\frac{BE}{AE} = \frac{CE}{DE}$

Explanation: If $\triangle$AED and $\triangle$BEC, are similar by SAS similarity rule, then their corresponding proportional sides are $\frac{BE}{AE} = \frac{CE}{DE}$

42. **(b)** 5 cm

Explanation: By Pythagoras theorem, we have

BC = $\sqrt{CE^2 + EB^2} = \sqrt{4^2 + 3^2} = \sqrt{16+9}$

= $\sqrt{25}$ = 5 cm

43. **(a)** $\frac{10}{3}$ cm

Explanation: Since $\triangle$ADE and $\triangle$BCE are similar.

$\therefore \frac{\text{Perimeter of } \Delta ADE}{\text{Perimeter of } \Delta BCE} = \frac{AD}{BC}$

$\Rightarrow \frac{2}{3} = \frac{AD}{5} \Rightarrow AD = \frac{5\times2}{3} = \frac{10}{3}$ cm

44. **(c)** $\frac{8}{3}$ cm

Explanation: $\frac{\text{Perimeter of } \triangle ADE}{\text{Perimeter of } \Delta BCE} = \frac{ED}{CE}$

$\Rightarrow \frac{2}{3} = \frac{ED}{4} \Rightarrow ED = \frac{4\times2}{3} = \frac{8}{3}$ cm

45. **(d)** All of these

Explanation: $\frac{\text{Perimeter of } \triangle ADE}{\text{Perimeter of } \Delta BCE} = \frac{AE}{BE} \Rightarrow \frac{2}{3}BE$ = AE

$\Rightarrow$ AE = $\frac{2}{3}\sqrt{BC^2 - CE^2}$

Also, in $\triangle$AED, AE = $\sqrt{AD^2 - DE^2}$

46. **(c)** 1410.5 cm^2

Explanation: 1410.5 cm^2

47. **(b)** 378 cm^2

Explanation: rea of the unshaded region = Area of square ABCD - Area of quadrant BCD

= 1764 - 1386 = 378 cm^2

48. **(c)** 1764 cm^2

Explanation: Area of square ABCD = 42 $\times$ 42 = 1764 cm^2

49. **(a)** 1386 cm^2

Explanation: Area of quadrant BCD

= $\frac{1}{4} \times \frac{22}{7} \times 42 \times 42$ = 1386 cm^2

50. **(c)** 24.5 cm^2

Explanation: Area of $\triangle$CEF = $\frac{1}{2} \times CE \times CF$

= $\frac{1}{2} \times 7 \times 7$ = 24.5 cm^2