**MATHEMATICS**

**PAGEMAKER10**

**3-D**

Q1. The ratio in which the line joining (2, 4, 5), (3, is divided by the -plane is

(a) 2 : 3

(b) 3 : 2

(c)

(d)

L1Difficulty1

Qtag Mathematics

Qcreator Pagemaker10

Q2. A straight line which makes an angle of 60° with each of and -axis, is inclined with -axis at an angle

(a) 45°

(b) 30°

(c) 75°

(d) 60°

L1Difficulty1

Qtag Mathematics

Qcreator Pagemaker10

Q3. The foot of the perpendicular from (0, 2, 3) to the line is

(a)

(b)

(c)

(d)

L1Difficulty1

Qtag Mathematics

Qcreator Pagemaker10

Q4. The line is parallel to the plane

(a)

(b)

(c)

(d)

L1Difficulty1

Qtag Mathematics

Qcreator Pagemaker10

Q5. The equation of line through the point (1, 2, 3) parallel to line is

(a)

(b)

(c)

(d) None of these

L1Difficulty1

Qtag Mathematics

Qcreator Pagemaker10

Q6. The points (1, 3, 4), ( and are the vertices of a

(a) rhombus

(b) rectangle

(c) parallelogram

(d) square

L1Difficulty1

Qtag Mathematics

Qcreator Pagemaker10

Q7. The angle between the lines with direction ratios is 60°. What is the value of

(a)

(b)

(c)

(d)

L1Difficulty1

Qtag Mathematics

Qcreator Pagemaker10

Q8. The equation of the plane passing through the point and containing the line joining the points (1, 1, 1) and is

(a)

(b)

(c)

(d)

L1Difficulty1

Qtag Mathematics

Qcreator Pagemaker10

Q9. If from a point perpendicular are drawn to -plane and -plane respectively, then the equation of the plane is

(a)

(b)

(c)

(d)

L1Difficulty1

Qtag Mathematics

Qcreator Pagemaker10

Q10. Equation of the plane perpendicular to the plane which passes through the points and is given by

(a)

(b)

(c)

(d) None of these

L1Difficulty1

Qtag Mathematics

Qcreator Pagemaker10

Q11. Equation of the plane through at right angle to is

(a)

(b)

(c)

(d) None of these

L1Difficulty1

Qtag Mathematics

Qcreator Pagemaker10

Q12. Equation of the plane that passes through the point and is perpendicular t the line joining the points and is given by

(a)

(b)

(c)

(d) None of these

L1Difficulty1

Qtag Mathematics

Qcreator Pagemaker10

Q13. Direction cosines of the line which is perpendicular to the lines whose direction ratios are and are given by

(a)

(b)

(c)

(d) None of these

L1Difficulty1

Qtag Mathematics

Qcreator Pagemaker10

Q14. Under what condition do the planes and intersect in a line?

(a)

(b)

(c)

(d)

L1Difficulty1

Qtag Mathematics

Qcreator Pagemaker10

Q15. A line makes the same angle with each of the and -axis. If the angle , which it makes with the -axis, is such that then what is the value of ?

(a)

(b)

(c)

(d)

L1Difficulty1

Qtag Mathematics

Qcreator Pagemaker10

Q16. The line passing through 1, 2, 3) and having direction ratios given by cuts the -axis at a distance from origin. What is the value of ?

(a) 0

(b) 1

(c) 2

(d) 3

L1Difficulty1

Qtag Mathematics

Qcreator Pagemaker10

Q17. If the distance between the points and is 13 units, then what is one of the values of ?

(a) 20

(b) 10

(c) 9

(d) 8

L1Difficulty1

Qtag Mathematics

Qcreator Pagemaker10

Q18. What are the direction ratios of the line of intersection of the planes and ?

(a)

(b)

(c)

(d)

L1Difficulty1

Qtag Mathematics

Qcreator Pagemaker10

Q19. What is the equation to the plane through parallel to ?

(a)

(b)

(c)

(d)

L1Difficulty1

Qtag Mathematics

Qcreator Pagemaker10

Q20. What is the angle between the lines and ?

(a)

(b)

(c)

(d) None of these

L1Difficulty1

Qtag Mathematics

Qcreator Pagemaker10

**Solutions**

S1. Ans. (a)

Sol.

Let the required ratio be Then, the point is . It lies on -plane, so its -coordinate of

i.e.

So, the ratio is 2 : 3 externally.

S2. Ans. (a)

Sol.

Let be the angle, then the of the line are .

By the formula

we get

S3. Ans. (c)

Sol.

Any point on the given line is If it is the foot of the perpendicular from , then

So, foot of the perpendicular is .

S4. Ans. (a)

Sol.

Let the line is parallel to the plane

Then, normal to the plane is perpendicular to the line.

i.e.

In this question, this condition is satisfied by the plane

S5. Ans. (a)

Sol.

Let the equation of the passing through is

But it is parallel to the given line

Hence, the required line is

S6. Ans. (a)

Sol.

Let points and have coordinates (1, 3, 4), and respectively.

=

And

But

So, the points and are the vertices of a rhombus.

S7. Ans. (b)

Sol.

[applying componendo and dividend]

S8. Ans. (d)

Sol.

Equation of a plane through is given by

It contains the line joining the points and so these points also lie in the plane.

At

and at

[say]

So, equation of the plane is

S9. Ans. (b)

Sol.

and are the foot of perpendicular from to -plane and -planes are given by and plane through origin is

…(i)

It passes through and so

and

[say]

So, the equation of the plane is\

S10. Ans. (b)

Sol.

Equation of a plane through is

…(i)

It passes through

…(ii)

It is perpendicular to the plane

…(iii)

On solving Eqs. (ii) and (iii), we get

On putting these values of and in Eq. (i), we get the equation of the required plane

S11. Ans. (a)

Sol.

Coordinates of the given point are

is normal to the required plane, so direction ratios of the normal to the plane are

So, equation of the plane through is

.

Since, the direction ratios of the normal to the plane are

So, we have

Hence, the equation of the required plane is

S12. Ans. (a)

Sol.

Direction ratios of the line joining the points are i.e.

Equation of the plane through

is …(i)

This plane is perpendicular to the line so the direction ratios of the normal to the plane (i) are and hence, we have

Therefore, the equation of the required plane is

S13. Ans. (a)

Sol.

Let be the direction ratios of given line.

…(i)

...(ii)

From Eqs. (i) and (ii), we get

So, are the direction ratios of given line.

Hence, direction cosines will be

.

S14. Ans. (c)

Sol.

The given planes are

…(i)

…(ii)

…(iii)

The equation of planes passing through the line of intersection of planes (i) and (ii) are

or …(iv)

Eqs. (iii) and (iv) are identical.

and

S15. Ans. (a)

Sol.

…(i)

Also,

From Eq. (i),

S16. Ans. (a)

Sol.

The equation of line which is passing through and having direction ratio (1, 2, 3)is

[say]

and

and

At -axis, and and

and

Hence, the line cuts -axis at a distance

S17. Ans. (c)

Sol.

Given, the distance between the points

and

On squaring equation both sides, we get

S18. Ans. (c)

Sol.

Given equations of the plane

…(i)

and …(ii)

Therefore, the required equation of the line intersecting by two planes (i) and (ii),

…(iii)

Hence, the direction ratio’s of line (iii) is

S19. Ans. (c)

Sol.

The equation of any plane parallel to the plane may be taken as

…(i)

If plane (i) passes through the point (1, 2, 3), we get

…(ii)

On putting in Eq. (i), we get required equation

i.e.

S20. Ans. (a)

Sol.

Given lines are …(i)

and

…(ii)

If is the acute angle between lines (i) and (ii), then

.

**LEVEL-II**

Q1. What are the direction cosines of a line which is equally inclined to the positive directions of the axes?

(a)

(b)

(c)

(d)

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q2. What is the angle between the planes and ?

(a)

(b)

(c)

(d)

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q3. If the straight line is parallel to the plane then which one of the following is correct?

(a)

(b)

(c)

(d)

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q4. What is the distance between the planes and

(a) 3 units

(b) 1 unit

(c) 0

(d) None of these

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q5. What should be the value of for which the equation represents the sphere?

(a) 3

(b) 2

(c) 1

(d)

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q6. If a line makes 30° with the positive direction of -axis, with the positive direction of -axis and with the positive direction of -axis, then what is equal to?

(a) 1/4

(b) 1/2

(c) 3/4

(d) 1

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q7. What is the distance of the line from the origin?

(a) 1 unit

(b) 1.5 units

(c) 2 units

(d) 2.5 units

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q8. The lines and

(a) are perpendicular

(b) are parallel

(c) intersect at an angle 45°

(d) intersect at an angle 60°

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q9. The radius of the sphere is

(a) 2

(b) 3

(c) 4

(d) 5

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q10. The direction ratios of the line perpendicular to the lines with direction ratios and are

(a)

(b)

(c)

(d)

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q11. If and be four points such that then the lines and and

(a) skew

(b) parallel

(c) intersecting

(d) none of these

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q12. A vector is inclined at equal angles of and If the magnitude of is 6 unit, then is equal to

(a)

(b)

(c)

(d)

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q13. If the projection of a line segment of and axes are respectively 3, 4, and 5, then the length of the line segment is

(a)

(b)

(c)

(d) none of these

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q14. The direction ratios of a normal to the plane through (1, 0, 0), (0, 1, 0), which makes an angle of with the plane are

(a)

(b)

(c)

(d)

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q15. A vector is equal inclined with the coordinate axes. If the tip of is in the positive octant and then is

(a)

(b)

(c)

(d)

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q16. The equation of the plane through the points (2, 3, 1) and and parallel to -axis is

(a)

(b)

(c)

(d) none of these

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q17. The equation of the plane perpendicular to the -plane and passing through the points and is

(a)

(b)

(c)

(d)

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q18. The point in which the line cuts the surface is

(a)

(b)

(c)

(d)

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q19. The edge of a cube is of length then the shortest distance between the diagonal of a cube and an edge skew to it is

(a)

(b)

(c)

(d)

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q20. The equation of the plane through the line and parallel to the line is

(a)

(b)

(c)

(d)

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

**Solutions**

S1. Ans. (b)

Sol.

If and are the angles that a line makes with the coordinate axes.

Then, and

…(i)

Here, , as line is equally inclined to axes.

From Eq. (i),

[since, direction cosines of a line which is equally inclined to the positive directions of the axis, so we take only positive sign]

or

Hence, the required direction cosines are

S2. Ans. (d)

Sol.

Given equation of planes

…(i)

and …(ii)

Here, and

and are direction ratios of planes (i) and (ii) respectively.

Let be the angle between two planes.

Then,

So, the required angle is .

S3. Ans. (d)

Sol.

Given then, equation of straight line is

…(i)

and equation of plane is …(ii)

Since, the straight line is parallel to the plane, i.e. normal to the plane is perpendicular to the straight line.

By perpendicularity condition,

S4. Ans. (d)

Sol.

The given equation of planes

…(i)

and …(ii)

Since, both planes are parallel to each other, then distance between them

S5. Ans. (b)

Sol.

The given equation represents the equation of sphere, if coefficient of and are same, i.e .

S6. Ans. (a)

Sol.

We know that, if a line makes an with the positive direction of -axis, with the positive direction of -axis and with the positive direction of -axis, then

Given that,

S7. Ans. (a)

Sol.

Distance of the line from the origin

unit

S8. Ans. (a)

Sol.

Here,

and

DR’s of the lines are

and

i.e.

Hence, both lines are perpendicular.

S9. Ans. (b)

Sol.

Given,

Compare it with equation of a sphere

we get

Now, radius of a sphere

S10. Ans. (a)

Sol.

Let DR’s of the line be

We have,

and

S11. Ans. (d)

Sol.

Given:

The point which divides in the ratio 8 : 3 is the same as the point which divides in the ratio 5 : 6. Hence, the lines and intersect.

S12. Ans. (c, d)

Sol.

Let be inclined at an angle to each axis, then

Since

If is acute :

If is obtuse

S13. Ans. (b)

Sol.

Let be the d.c’s of the given line segment

where are the angles which the line segment makes with the axes.

Suppose length of line segment

Thus, projection of line segment on -axis

Also the projection of line segment on -axis = 3 (given).

Similarly,

Now squaring and adding these equations, we get

[

S14. Ans. (b)

Sol.

Any plane through is

…(1)

It contains if …(2)

Also, (1) makes an angle of with the plane

therefore,

…(3)

From (2) and (3),

Hence A : A : ±

Direction ratios are 1 : 1 : ±

S15. Ans. (d)

Sol.

Let be the DC’s of . Then (given).

S16. Ans. (c)

Sol.

Any plane parallel to -axis is .

If it passes through and then

and

i.e., i.e.,

Hence the plane parallel to -axis is

S17. Ans. (c)

Sol.

Let the plane be

…(1)

The -plane is or …(2)

Since (1) and (2) are perpendicular to each other, we have

i.e.,

The plane (1) reduces to

Now since it passes through and

we get

and

giving

Thus the plane is

S18. Ans. (a, c)

Sol.

Let

Any point on the line is for every value of

If this point lies on the surface then

i.e.,

i.e.,

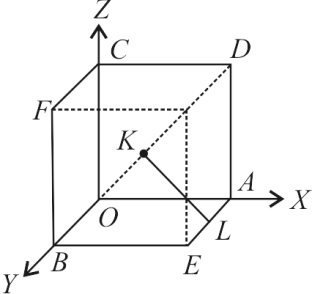
i.e., i.e.,

For these two values of the two points in which the given line cuts the surface are and

S19. Ans. (d)

Sol.

Required distance =

****

.

S20. Ans. (a)

Sol.

Any plane through the given line

(From

If this plane is parallel to the line then the normal to the plane is also perpendicular to the above line or

.

(From )

This gives and the required plane is

**LEVEL-III**

Q1. The equation of the plane containing the line and the point is

(a)

(b)

(c)

(d) none of these

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q2. The equation represents a

(a) circle

(b) plane

(c) sphere of radius 4

(d) sphere of radius 3

(e) none of these

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q3. The radius of the circle is

(a)

(b)

(c)

(d) none of these

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q4. The smallest radius of the sphere passing through and is

(a)

(b)

(c)

(d)

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q5. The ratio in which the plane divides the line joining the points and is

(a) 3 : 5

(b) 1 : 10

(c) 3 : 10

(d) 1 : 5

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q6. A plane is parallel to lines whose direction ratios are and and it contains the point (1, 1, 1). If it cuts coordinates axes at then the volume of the tetrahedron is

(a) 9/5 cu units

(b) 9/4 cu units

(c) 9/2 cu units

(d) none of these

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q7. Gives the line and the plane Of the following assertions, the only one that is always true is

(a) is to

(b) lines in

(c) is parallel to

(d) none of these

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q8. Radius of circle

(a) 5

(b) 4

(c) 3

(d) 2

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q9. The position vector of the centre of the circle is

(a)

(b)

(c) 3(

(d) none of the above

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q10. Equation of the line passing through (1, 1, 1) and parallel to the plane is

(a)

(b)

(c)

(d)

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q11. The distance between the line and the plane is

(a)

(b)

(c)

(d) None of these

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q12. Equation of the plane parallel to the planes and equidistant from them is

(a)

(b)

(c)

(d) none of these

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q13. The plane and sphere

(a) touch each other

(b) cut in a circle

(c) do not meet

(d) none of these

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q14. Which of the triplet can not represent direction cosines of a line :

(a)

(b)

(c)

(d)

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q15. If is a point on the line segment joining and such that the projection of on the axes are 13/5, 19/5, 26/5 respectively, then divides in the ratio

(a) 1 : 2

(b) 3 : 2

(c) 2 : 3

(d) 1 : 3

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q16. A circle with centre (2, 3, 0) and radius 1, is drawn in the plane Equation of the sphere which passes through this circle and through the point (1, 1, 1) is

(a)

(b)

(c)

(d)

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q17. From the point the normals drawn to planes and are then the equation of plane is

(a)

(b)

(c)

(d)

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q18. The reflection of the point in the line is

(a)

(b)

(c)

(d)

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q19. If is a point on the line segment joining and such that the projection of on the axes are respectively, then divides in ratio

(a) 1 : 3

(b) 2 : 3

(c) 3 : 2

(d) 3 : 1

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q20. A mirror and a source of light are situated at the origin and at a point on respectively. A ray of light from the source strikes the mirror and is reflected. If the of the normal to the plane are then of the reflected ray are

(a)

(b)

(c)

(d)

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

**Solutions**

S1. Ans. (c)

Sol.

Any plane containing is

…(1)

where ...(2)

If the plane through then

…(3)

From (2) and (3),

i.e.,

Hence the plane (1) becomes

i.e.,

S2. Ans. (c)

Sol.

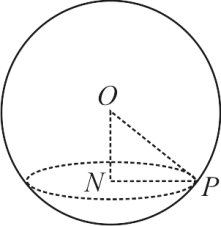
Since the equation represents a sphere of radius , therefore

represents a sphere of radius

S3. Ans. (b)

Sol.

The sphere has centre at the origin and radius 7.

****

Distance of the plane from the origin.

Thus in Fig.

Hence the radius of the circle =

S4. Ans. (a)

Sol.

Let the sphere be

It passes through …(1)

It passes through …(2)

It passes through …(3)

Radius of the sphere =

Now

radius

S5. Ans. (c)

Sol.

Let the plane divide the line joining the points

and in the ratio at the point

is

This lies on the given plane,

Reqd. ratio is

S6. Ans. (c)

Sol.

Let the equation of the plane through be

Since it is parallel to the straight lines having dr’s and , therefore

and

Therefore, equation of plane is

or

Its intercepts on coordinate axes are and Hence, the volume of tetrahedron

cu. units.

S7. Ans. (b)

Sol.

Since

given line is to the normal to the plane i.e., given line is parallel to the given plane.

Also, lies on the plane if

i.e.,

which is true lies in plane .

S8. Ans. (b)

Sol.

Given circle is intersection of sphere

…(i)

and plane …(ii)

Centre of sphere is

Length of the from, upon (ii)

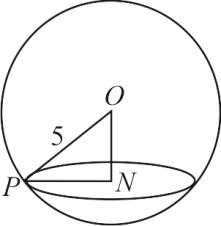
Radius of the sphere =

Radius of the circle =

S9. Ans. (a)

Sol.

The equation of is …(i)

****

Since it passes through the origin and is parallel to the vector ,any pt. on it is If this pt. lies on the plane

then

or

Putting the value of in (), we get the position vector N i.e., centre of the circle as

S10. Ans. (b)

Sol.

If the direction ratios of the line are then it is perpendicular to the normal to the plane.

And the only values of that satisfy this equation are

is the correct answer.

S11. Ans. (b)

Sol.

The given line is

where and given plane is

where

Since

given line is parallel to the given plane the distance between the line and the plane is equal to length of the perpendicular from the point on the line to the given plane.

Reqd. distance =

S12. Ans. (a)

Sol.

d are given parallel planes. Let the plane equidistant from them be .

Now, i.e., the equation of plane equidistant from them is

S13. Ans. (d)

Sol.

Distance of plane from centre of sphere

(radius of sphere), so plane touches it.

S14. Ans. (d)

Sol.

are direction cosines of a line only if so can not represent direction cosines of a line.

S15. Ans. (b)

Sol.

Since has projections and on the coordinate axes, therefore Suppose divides the join of and in the ratio . Then, the position vector of is

.

S16. Ans. (d)

Sol.

Equation of the given circle is

Equation of any sphere through this circle is

or

Since it passes through

and the required equation is

S17. Ans. (b)

Sol.

are perpendiculars drawn from on and planes

and are points on and planes.

The equation plane passing through is

which also passes through and

…(1)

…(2)

Solving (1) and (2), we get

Required equation is

S18. Ans. (b)

Sol.

Coordinats of any point on the given line are

So, the direction cosines of are

Now, PQ is perpendicular to the given line,

if

So, the coordinates of the foot of the perpendicular from on the line are

Let be the reflection of in the given line.

Then, is the mid-point of

So, the coordinates of the required point are

S19. Ans. (c)

Sol.

Since has projection and on the coordinate axes, therefore Let divides the join of and in the ratio

The position vector of is

S20. Ans. (d)

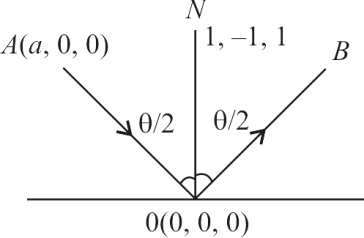
Sol.

Let the source of light be situated at where Let be the incident ray and the reflected ray. is the normal to the mirror at

(say)

of are and so its are

of are

****

Let be the of the reflected ray . Then,

and

Hence, of the reflected ray are