KARNATAKA SECONDARY EDUCATION EXAMINATION BOARD

SSLC ANUAL EXAM- MARCH/APRIL – 2022

Subject : Mathematics | **Duration: 3 hours 15 min**
Date: 04/04/2022 | **Subject code: 81E**
Maximum marks: 80 | **Time: 10-30 AM to 1-45 PM**

MODEL KEY ANSWERS (BY SHIVAJI.T, MMDRS HARAPANAHALLI TOWN)

1. The graphical representation of the pair of linear equation x+2y-4=0 and 2x+4y-12=0 is
A) Intersecting lines B)Parallel lines C) Coincident D)Perpendicular

Answer: B)

2. The common difference in the arithmetic progression 8, 5, 2,.. is
A)-3 B)-2 C) 3 D) 4
Answer: A)
3. The standard form of $2x^2=x-7$ is …….
A) $2x^2-x= -7$ B) $2x^2+x-7=0$ C) $2x^2-x+7=0$ D) $2x^2+x+7=0$
Answer: C)
4. The value of cos $(90-30)^0$ is ….
A)-1 B) $\frac{1}{2}$ C) 0 D) 1
Answer: B)
5. The distance of a point p(x, y) from the origin is …….
A) $\sqrt{x^2+y^2}$ B) x^2+y^2 C) $\sqrt{x^2-y^2}$ D) x^2-y^2
Answer: A)
6. In a circle, the angle between the tangent and the radius at the point of contact is ……
A) 30^0 B) 60^0 C) 90^0 D) 180^0.
Answer: C)
7. In the given figure the volume of the frustum of a cone is ……….
A) $\prod(r1+r2)l$ B) $\prod(r_1-r_2)l$ C) $\frac{1}{3}\prod h(r_1^2-r_2^2-r_1r_2)$ D) $\frac{1}{3}\prod h(r_1^2+r_2^2+r_1r_2)$
Answer: D)
8. The surface area of the sphere of radius r is ……..
A) $\prod r^2$ sq units B) $2\prod r^2$ sq units C) $3\prod r^2$ sq unit D) $4\prod r^2$ sq units
Answer: D)
Answer the following questions 8x1= 8

9. If the pair of linear equations are consistent, then how many solutions do they have?.
   Solution : No solutions
10. In an arithmetic progression, a is the first term and d is common difference then write the nth term of this A.P.
    Solution: an=a+(n-1)d
11. Write the standard form of quadratic equation.
    Solution: $ax^2+bx+c=0$
12. Write the value of $\frac{\sin 18}{\cos 72}$.
    Solution: 1
13. Write the distance of the point (4, 3) from the origin.
    Solution: 3
14. Find the median score of the data 6, 4, 2, 10 and 7.
    Solution: 6
15. Write the statement of basic proportionality theorem (Thales theorem).
    Solution: A line is drawn parallel to any one of the side which divides the other two sides are in the same ratio.
16. Write the formula to find Curved surface area of cone.
    Solution: CSA of cone= ∏rl.

Answer the following questions 8x2=16

17. Solve the pair of linear equations by elimination method
    2x+y=8
    x-y=1
    Solution: let the equations are 2x+y=8 --------→(1)
    x-y=1 --------→(2)
    Subtract above equations for eliminating the value of y, then we get x
    2x+y=8
    x-y=1
    3x= 9, then **x=3** & **y=2**
18. Find the 30^{th} term of the arithmetic progression 5, 8, 11, ………… using the formula.
    Solution: a= 5 and d= 8-5= 3, 30^{th} term is a+29d= 5+29x3
    = 5+87
    30^{th} term is 92
19. Find the sum of first 20 terms of A.P 10+15+20+……………… using formula.

OR

Find the sum of first 20 positive integers.

Solution: a= 10, d= 5 & n=20 the sum of first 20 terms is

$S_n = \frac{n}{2}\{2a + (n-1)d\}$

$S_{20} = \frac{20}{2}\{2x10 + (20-1)x5\}$ = 10 $\{20 + 19x5\}$ = 10x115 = 1150.

OR

We have formula to find the sum of first n terms of positive integers is

$S_n = \frac{n}{2}\{n+1\}$, **here n=20**

$S_{20} = \frac{20}{2}\{20+1\}$ **= 10x21 = 210**

Hence the sum of first 20 terms of positive integers is 210.

20. Find the roots of the equation $x^2+5x+2=0$ by using quadratic formula.

Solution: here a=1, b=5 and c=2

Quadratic formula is

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

$$x = \frac{-(5) \pm \sqrt{5^2-4x1x2}}{2x1} = \frac{5 \pm \sqrt{25-8}}{2} = \frac{5 \pm \sqrt{17}}{2}$$

$$x = \frac{5+\sqrt{17}}{2} \text{ or } x = \frac{5-\sqrt{17}}{2}.$$

21. Find the value of the discriminant and hence write the nature of roots of the equation $x^2+4x+4=0$.

Solution: a=1, b=4 & c= 4, nature of roots is $\Delta = b^2-4ac$.

= 16-4x1x4 = 16-16 = 0

Δ =0,

Hence the roots are **real & equal.**

22. Find the distance between the two points (2, 6) and (5, 10).

OR

Find the coordinates of the midpoint of the line joining the points (3, 4) and (5,6) using midpoint formula.

Solution: the distance formula is d= $\sqrt{(x2-x1)^2 + (y2-y1)^2}$

d=$\sqrt{(5-2)^2 + (10-6)^2}$

d=$\sqrt{(3)^2 + (4)^2}$ = $\sqrt{9+16}$ = 5 units.

Distance is 5 units

OR

By midpoint formula, coordinates (x, y)= $\left[\frac{x2+x1}{2}, \frac{y2+y1}{2}\right]$

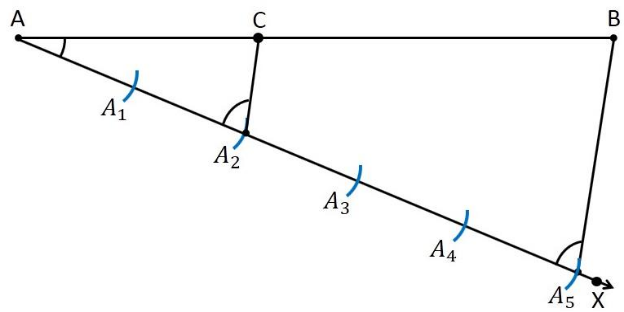
$$= \left[\frac{3+5}{2}, \frac{4+6}{2}\right]$$

$$= \left[\frac{8}{2}, \frac{10}{2}\right]$$

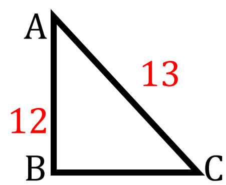
$$= (4, 5)$$

23. Divide the line segment AB=10cm in the ratio of 2: 3 geometrically.

Solution:



24. From the given figure find the value of sin**θ** and tan**α**



Solution: we want side BC, by applying Pythagoras theorem we get BC=5cm.

Sin**θ**$= \frac{opp}{hyp} = \frac{AB}{AC} = \frac{12}{13}$

Tan**α** $= \frac{opp}{adj} = \frac{BC}{AB} = \frac{5}{12}$

Answer the following question 9x3= 27

25. If the sum of first 9 terms of an A.P is 144 and 9^{th} term of it is 28. Find the first term and common difference.

Solution: Given S_9=144 **a_9=28**

$\frac{n}{2}\{2a + (n-1)d\} = 144$ a+8d=28----------→(2)

$\frac{9}{2}\{2a + (9-1)xd\} = 144$

$\frac{9}{2}\{2a + 8d\} = 144$

2a+8d= 16x2

2a+8d=32 divided by 2 we get a+4d=16 -------------→(2)

Solve above two equations we get 4d= 12, d=3 and a= 4

So first term of this A.P is 4 and common difference is 3.

26. The diagonal of the rectangular field is 60m more than its shorter side. If longer side is 30m more than shorter side, then find the sides of the field.

OR

In a right angled triangle, the length of the hypotenuse is 13cm. among the remaining two sides, the length of one side is 7cm more than the other side. Find the sides of the triangle.

Solution: let shorter side be x and longer side be y.

According to problem, diagonal is (x+60) and y=30+x

By Pythagoras theorem, $(x+60)^2= x^2+(30+x)^2$.

$x^2+3600+120x= x^2+900+x^2+60x$

$3600-900+120x-60x=x^2$

$x^2-60x-2700=0$

solve above equation by using formula we get x=90

hence the shorter side is 90m and longer side is (90+30)= 120m.

27. Prove that $\sec\theta(1-\sin\theta)(\sec\theta+\tan\theta)= 1$

OR

$(\text{Sin}A+\text{cosec}A)^2+(\text{Cos}A+\sec A)^2=7+\text{Tan}^2A+\cot^2A$.

Solution: To prove $\sec\theta(1-\sin\theta)(\sec\theta+\tan\theta)= 1$

$$\frac{1-sin\theta}{cos\theta}\left(\frac{1}{cos\theta}+\frac{sin\theta}{cos\,\theta}\right)$$

$$\frac{1-sin\theta}{cos\theta}\left(\frac{1+sin\theta}{cos\,\theta}\right)$$

$$\frac{1-sin2\theta}{cos2\theta}=\frac{cos^2\theta}{cos^2\theta}=1$$

Hence the proof

OR

LHS = $(\sin A + \text{cosec}A)^2 + (\cos A + \sec A)^2$

= $\sin^2A + \text{cosec}^2A + 2 \sin A\, \text{cosec}A + \cos^2A + \sec^2A + 2 \cos A \sec A$

= $\sin^2A + \cos^2A + 2 + \text{cosec}^2A + \sec^2A + 2$

= $1 + 4 + \text{cosec}^2A + \sec^2A$

= $5 + 1 + \cot^2A + 1 + \tan^2A$

= $7 + \cot^2A + \tan^2A$

28. Find the coordinates of the line segment of the line joining the two points A(-1, 7) & B(4, -3) which divides AB internally in the ratio 2:3.

OR

Find the area of the triangle PQR which vertices P(0, 4), Q(3, 0) & R(3, 5).

Solution: we have $(x_1, y_1) = (-1, 7)$, $(x_2, y_2)= (4, -3)$ & m:n=2:3

By section formula, $P(x_1, y_1) = \left[\frac{mx2+nx1}{m+n}, \frac{my2+ny1}{m+n}\right]$

$= \left[\frac{2x4+3(-1)}{2+3}, \frac{2(-3)+3x7}{2+3}\right]$

$= \left[\frac{5}{5}, \frac{15}{5}\right]$

$= (1, 3)$

OR

Area of the triangle is $A=\frac{1}{2}\{x1(y2-y3)+x2(y3-y1)+x3(y1-y2)\}$

$=\frac{1}{2}\{0(y2-y3)+3(5-4)+3(4-0)\}$

$=\frac{1}{2}(3+12)$

$= 7.5$ sq units.

29. Find the mean of the following data by direct method.

C.I	f
10-20	2
20-30	3
30-40	5
40-50	7
50-60	3

OR

Find the mode scores in the following data.

C.I	f
5-15	3
15-25	4
25-35	8
35-45	7
45-55	3

Solution:

C.I	f	x	fx
10-20	2	15	30
20-30	3	25	75
30-40	5	35	175
40-50	7	45	315
50-60	3	55	165
	n=20		$\sum fx = 760$

Mean by direct method, $x = \frac{\sum fx}{n} = \frac{760}{20} = 38$

Mean = 38

OR

C.I	f	
5-15	3	
15-25	4	f_0
25-35	8	f_1
35-45	7	f_2
45-55	3	

Here LRL=25, f_1=8, f_0=4, f_2=7 and h=10

Mode= LRL+ $\left\{\frac{f1-f0}{2f1-f0-f2}\right\}$x h

= 25+$\left\{\frac{8-4}{16-4-7}\right\}$x 10

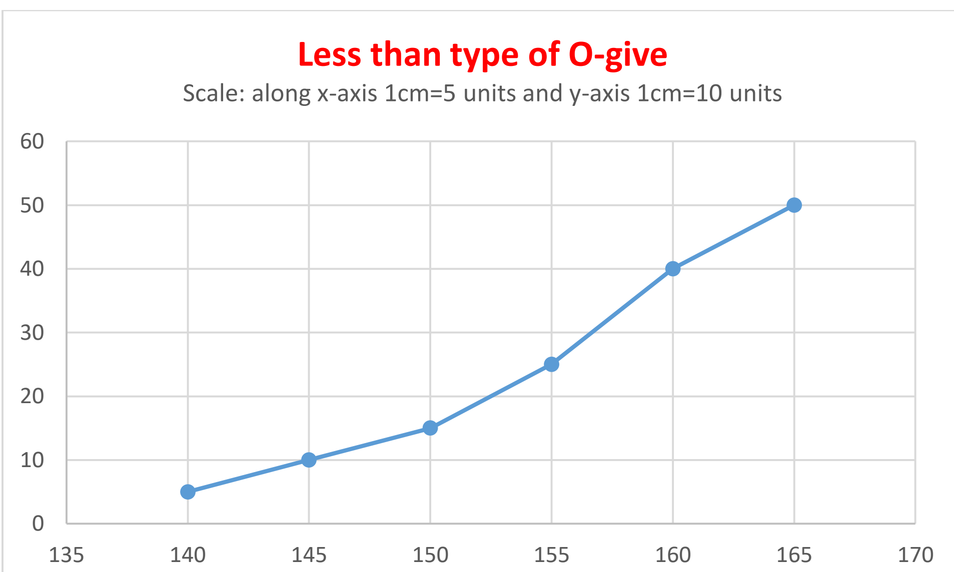
= 25+8

Mode=33

30. During a medical check-up 50 students of a class their heights were recorded as follows:

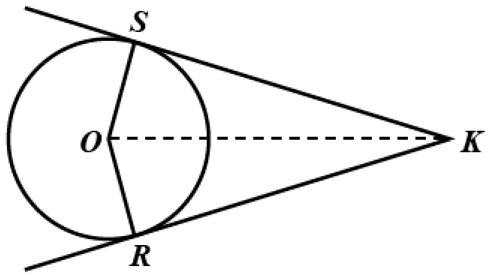
Height	<140	<145	<150	<155	<160	<165
fc	5	10	15	25	40	50

Solution:



31. Prove that "the lengths of the tangent drawn from an external point to the circle are equal".

Solution:



To prove that: SK=RK

Proof:

Normal and tangent at a point on the circle are perpendicular to each other.

$\angle OSK = \angle ORK = 90^o$

Using Pythagoras Theorem,

$OK^2 = OS^2 + SK^2$............(i)

$OK^2 = OR^2 + RK^2$............(ii)

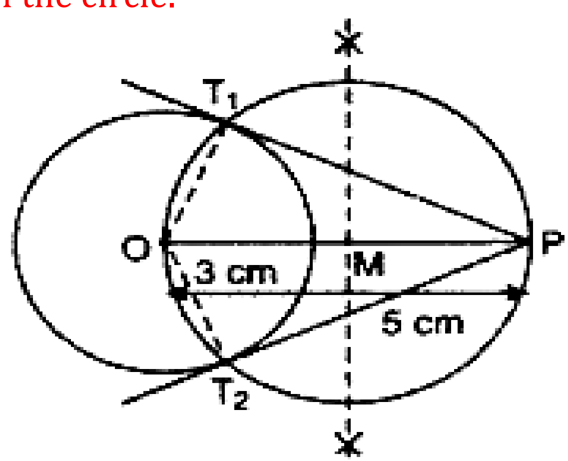
Subtracting (ii) from (i),

$OK^2 - OK^2 = OS^2 + SK^2 - OR^2 - RK^2$

$\Rightarrow SK^2 = RK^2$ $\because OS = OR$

SK=RK

32. Construct two tangents to the circle of radius 3cm from a point 8cm away from the center of the circle.



33. The volume of a right circular cylinder is 2156 cm^3. If the height of the cylinder is 14cm, then find its curved surface area.

Solution: V=2156

$\prod r^2 h = 2156$ === > $\frac{22}{7} x\ r^2\ x\ 14 = 2156$ =➔ r=7

Curved surface area of the cylinder is 2∏rh= $2x\frac{22}{7}$ x 7 x 14 = 616 sq cm.

34. Find the solution of the following pair of linear equations by graphical method.
x+y=5 & x+2y=6

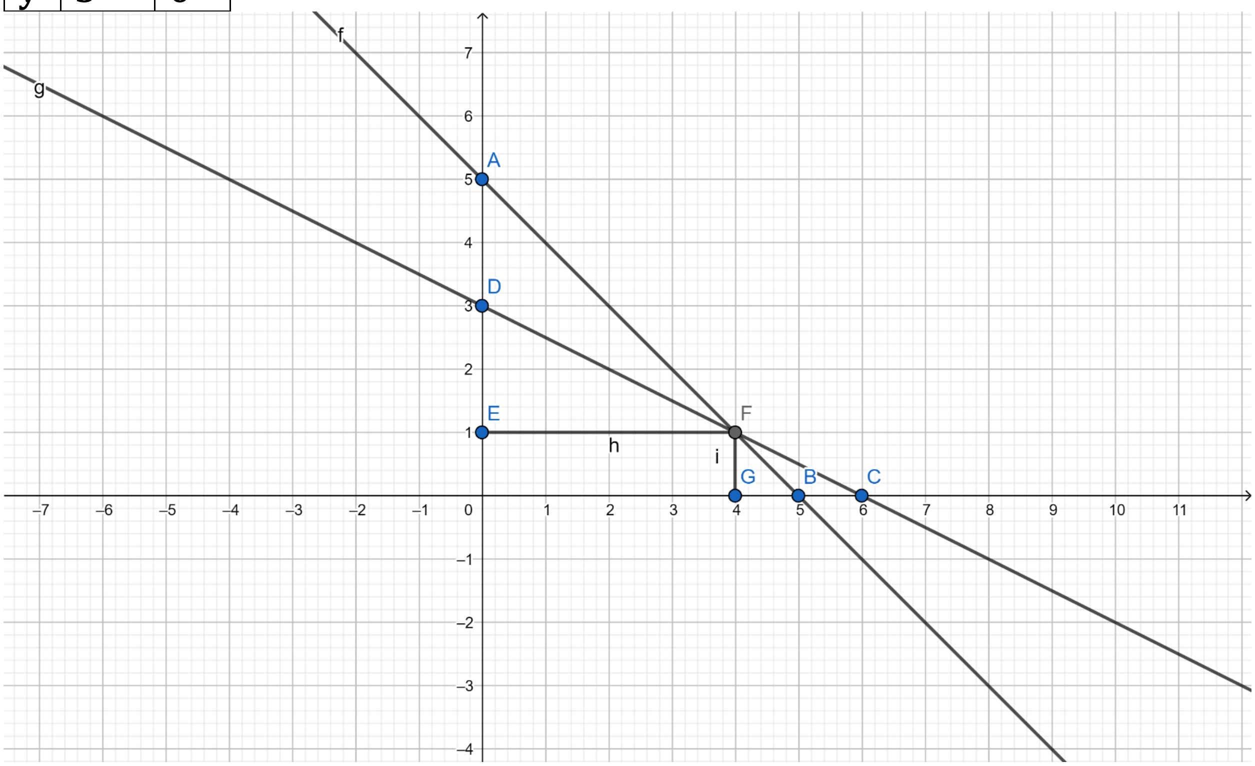
Solution:

X+y=5

x	**0**	**5**
y	**5**	**0**

X+2y=6

x	**0**	**6**
y	**3**	**0**



The value of x and y is (x=4, y=1)

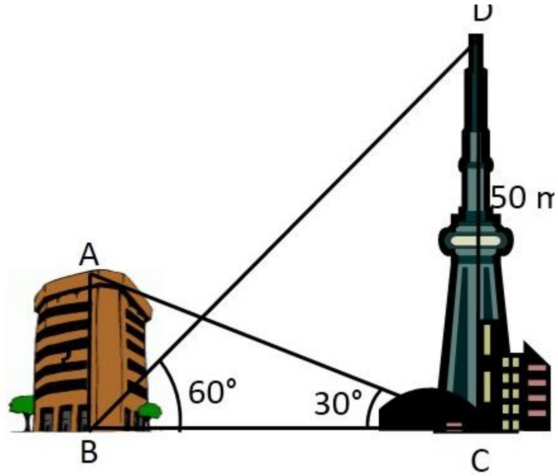
35. The angle of elevation of the top of the building from the foot of the tower is 30^0. And angle of elevation of the top of the tower from the foot of the building is 60^0. If the height of the tower is 50. Find the height of building.

OR

As observed from 75m high light house from the sea level, the angle of depression of two ships 30^0 and 45^0. If one ship is exactly behind the other on the same side of the light house, then find the distance between two ships.

Solution:

Let building be AB & tower be CD



Given

Height of the tower = 50 m

Hence, CD = 50m

Angle of elevation of top of building from foot of tower = 30°

Hence, ∠ACB = 30°

Angle of elevation of top of tower from foot of building = 60°

Hence, ∠DBC = 60°

In triangle ABC & in triangle BCD

Tan $60^0 = \frac{opp}{adj}$ Tan $30^0 = \frac{opp}{adj}$

$\sqrt{3} = \frac{50}{BC}$ $\frac{1}{\sqrt{3}} = \frac{AB}{BC}$

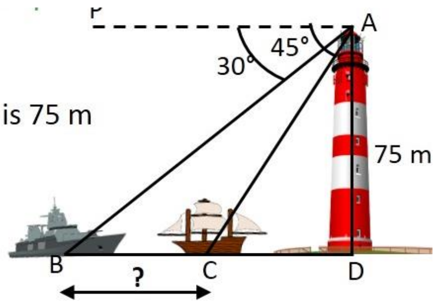
BC= $\frac{50}{\sqrt{3}}$ ----------→ (1) BC= $\sqrt{3}$ X AB -------→(2)

From 1 and 2

$\sqrt{3}$ X AB = $\frac{50}{\sqrt{3}}$ AB= $\frac{50}{3}$ = 16.66 m.

Height of the building is 16.6m.

OR



Given that height of the lighthouse is 75 m

Hence, AD = 75 m

And angle of depression of first ship is 45°

So, ∠ PAC = 45 °

And angle of depression of second ship is 30°

So, ∠ PAB = 30 °

We need to find distance between the two ships, i.e. BC

In triangle BDA, $\tan 30^0 = \frac{75}{BD}$ and in triangle CDA, $\tan 45 = \frac{75}{CD}$

$\frac{1}{\sqrt{3}} = \frac{75}{BD}$ $1 = \frac{75}{CD}$

BD= $75\sqrt{3}$ CD=75m

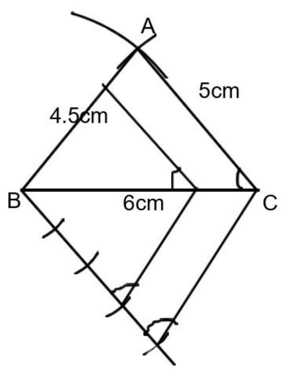
BC+CD= $75\sqrt{3}$

BC= $75\sqrt{3} - 75$

$= 75(\sqrt{3} - 1)$

36. Construct a triangle of side 4.5cm, 6cm and 8 cm. Then construct another triangle similar to it with ¾ of the corresponding sides of the first triangle.

Solution:



37. Construct a triangle of sides 6cm, 4cm and 7cm then construct an another triangle whose corresponding sides are 3/4 of the sides of the first triangle.

Solution: Given, length of the arc= 11

$\frac{\theta}{360}x2\prod r = 11$

$\frac{30}{360}x2\prod r = 11$

$\frac{11}{21}x\ r = 11$

$r = 21cm.$

$area\ of\ the\ shaded\ part = area\ of\ the\ major\ sector - ar\ of\ minor\ sector$

$= \frac{\theta}{360}x\prod R^2 - \frac{\theta}{360}x\prod r^2$.

$= \frac{\theta}{360}x\prod (R^2-r^2)$

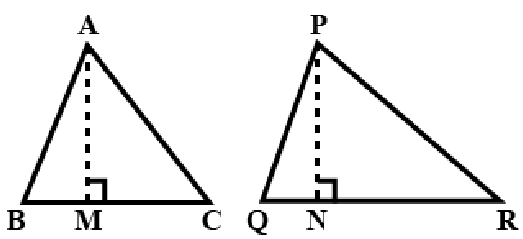
$= \frac{30}{360}x\prod (21^2-7^2)$

$= \frac{22}{12x7}(392)$

= 102.66 sq cm.

38. Prove that "the ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides".

Solution: Solution:



Let the two triangles be:

ΔABC and ΔPQR

Area of ΔABC=$\frac{1}{2}$×BC×AM……………..(1)

Area of ΔPQR=$\frac{1}{2}$×QR×PN……………………..(2)

Dividing (1) by (2)

$\frac{ar(ABC)}{ar(PQR)} = \frac{QR\times PN}{BC\times AM}$ ------------(3)

In ΔABM and ΔPQN

∠B=∠Q (Angles of similar triangles)

∠M=∠N (Both 90)

Therefore, ΔABM~ΔPQN

So, $\frac{AM}{AB} = \frac{PN}{PQ}$ ……………………..(4)

From 2 and 4

$\frac{ar(ABC)}{\text{ar(PQR)}} = \frac{QR \times BC}{\text{PN} \times \text{AM}}$

$\frac{ar(ABC)}{\text{ar(PQR)}} = \frac{BC}{QR} \text{ X } \frac{AB}{PQ}$ ------------(5)

But $\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AB}{PQ}$

Hence $\frac{ar(ABC)}{\text{ar(PQR)}} = (\frac{AB}{PQ})^2 = (\frac{BC}{QR})^2 = (\frac{AB}{PQ})^2$.