QUESTION PAPER CODE 430/4/3
EXPECTED ANSWER/VALUE POINTS
SECTION A

Question numbers 1 to 20 carry 1 mark each.

Choose the correct option in question numbers 1 to 10.

1. In Figure-1, number of zeroes of the polynomial p(x), shown in the graph are

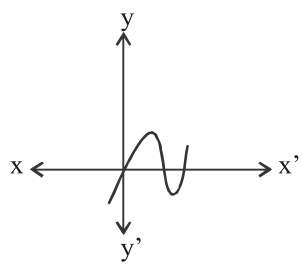

Figure 1

(A) 3 **(B) 2** **(C) 1** **(D) 4**

Sol. (A) 3 1

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2. A dice is thrown once. The probability of getting an odd number is

(A) 1 **(B) $\frac{1}{2}$** **(C) $\frac{4}{6}$** **(D) $\frac{2}{6}$**

Sol. (B) $\frac{1}{2}$ 1

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3. The value of k for which the equations $3x - y + 8 = 0$ and $6x + ky = -16$ represent coincident lines, is

(A) $-\frac{1}{2}$ **(B) $\frac{1}{2}$** **(C) 2** **(D) – 2**

Sol. (D) –2 1

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4. If sin A = cos A, $0 \leq A \leq 90°$, then the angle A is equal to

(A) 30° **(B) 60°** **(C) 0°** **(D) 45°**

Sol. (D) 45° 1

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5. Total surface area of a solid hemisphere is

(A) $3\pi r^2$ **(B) $2\pi r^2$** **(C) $4\pi r^2$** **(D) $\frac{2}{3}\pi r^3$**

Sol. (A) $3\pi r^2$ 1

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6. The second term from the end of the A.P. 5, 8, 11, ..., 47 is

(A) 50 **(B) 45** **(C) 44** **(D) 41**

Sol. (C) 44 1

7. Sides of two similar triangles are in the ratio 4 : 9. Areas of these triangles are in the ratio

(A) 4 : 9 **(B) 2 : 3** **(C) 81 : 16** **(D) 16 : 81**

Sol. (D) 16 : 81 1

8. Given that HCF (156, 78) = 78, LCM (156, 78) is

(A) 156 **(B) 78** **(C) 156 × 78** **(D) 156 × 2**

Sol. (A) 156 1

9. The discriminant of the quadratic equation $2x^2 - 4x + 3 = 0$ is

(A) – 8 **(B) 10** **(C) 8** **(D) $2\sqrt{2}$**

Sol. (A) –8 1

OR

Roots of the quadratic equation $2x^2 - 4x + 3 = 0$ are

(A) real and equal **(B) real and distinct** **(C) not real** **(D) real**

Sol. (C) Not Real 1

10. The distance between the points (– 1, – 3) and (5, – 2) is

(A) $\sqrt{61}$ units **(B) $\sqrt{37}$ units** **(C) 5 units** **(D) $\sqrt{17}$ units**

Sol. (B) $\sqrt{37}$ units 1

Fill in the blanks in question numbers 11 to 15.

11. The lengths of the tangents drawn from an external point to a circle are _______.

Sol. Equal 1

12. In the quadratic polynomial $t^2 - 16$, sum of the zeroes is _______.

Sol. 0 1

13. The distance between the points (– a, a) and (– a, – a) is _______.

Sol. 2a 1

14. The roots of the equation, $x^2 + bx + c = 0$ are equal if _______.

Sol. $b^2 = 4c$ 1

15. For a given distribution with 100 observations, the 'less than' ogive and 'more than' ogive intersect at (58, 50). The median of the distribution is _______.

Sol. 58 1

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16. Find the coordinates of the point on x-axis which divides the line segment joining the points (2, 3) and (5, – 6) in the ratio 1 : 2.

Sol. Let the point on x-axis be (x, 0) $\frac{1}{2}$

$\therefore$ Required point is (3, 0) $\frac{1}{2}$

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17. The angle of elevation of the top of the tower AB from a point C on the ground, which is 60 m away from the foot of the tower, is 30°, as shown in Figure-2. Find the height of the tower.

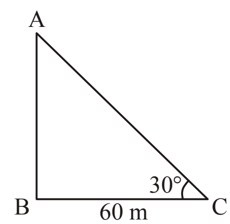

Figure 2

Sol. $\tan 30° = \frac{AB}{60°}$ $\frac{1}{2}$

$\Rightarrow AB = \frac{60}{\sqrt{3}}$ or $20\sqrt{3}$ m $\frac{1}{2}$

Answer the following question numbers 16 to 20.

18. Write the 26th term of the A.P. 7, 4, 1, –2, ...

Sol. d = –3 $\frac{1}{2}$

$a_{26} = -68$ $\frac{1}{2}$

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19. In Figure-3, PT is tangent to a circle centered at O. Find the value of ∠OTP if ∠POT = 75°.

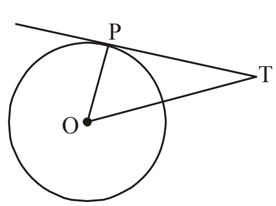

Figure 3

Sol. OP ⊥ PT ⇒ ∠OPT = 90° $\frac{1}{2}$

Hence, ∠OTP = 90° – 75° = 15° $\frac{1}{2}$

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20. If cosec θ = $\frac{5}{4}$, find the value of cot θ.

Sol. $\cot^2\theta = \frac{25}{16} - 1 = \frac{9}{16}$ $\frac{1}{2}$

$\cot\theta = \frac{3}{4}$ $\frac{1}{2}$

OR

Find the value of sin 42° – cos 48°.

Sol. sin 42° = cos (90° – 42°) = cos 48° $\frac{1}{2}$

∴ sin 42° – cos 48° = 0 $\frac{1}{2}$

SECTION B

Question numbers 21 to 26 carry 2 marks each.

21. If tan 2A = cot (A – 18°) where 2A and (A – 18°), both are acute angles, find the value of A.

Sol. cot (90° – 2A) = cot (A – 18°) 1

⇒ 3A = 108° $\frac{1}{2}$

⇒ A = 36° $\frac{1}{2}$

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22. The following table shows the ages of the patients admitted in a hospital during a year:

Age (in years):	5 – 15	15 – 25	25 – 35	35 – 45	45 – 55	55 – 65
Number of patients:	60	110	210	230	150	50

Find the mode of the distribution.

Sol. Modal class is 35 – 45 $\frac{1}{2}$

∴ Mode = $35 + \frac{230 - 210}{460 - 210 - 150} \times 10$ 1

= 37 $\frac{1}{2}$

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23. Given that the HCF of two numbers is 11 and their LCM is 693. If one of the numbers is 77, then find the other number.

Sol. Other number = $\dfrac{11\times 693}{77}$ 1

$= 99$ 1

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24. A cylindrical bucket, 32 cm high and with radius of base 14 cm, is filled completely with sand. Find the volume of the sand. (Use $\pi = \dfrac{22}{7}$)

Sol. Volume of sand = $\dfrac{22}{7}\times 14\times 14\times 32$ 1

$= 19712\ \text{cm}^3$ 1

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25. In Figure-4, ΔABC and ΔXYZ are shown. If AB = 3.8 cm, AC = $3\sqrt{3}$ cm, BC = 6 cm, XY = $6\sqrt{3}$ cm, XZ = 7.6 cm, YZ = 12 cm and $\angle A = 65°$, $\angle B = 70°$, then find the value of $\angle Y$.

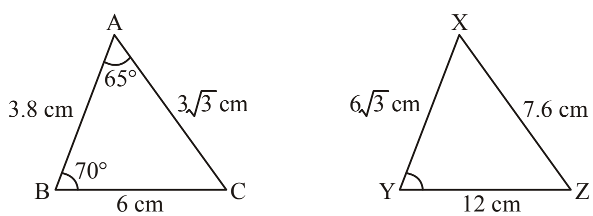

Figure 4

Sol. $\Delta ABC \sim \Delta XZY$ 1

$\Rightarrow \angle Y = \angle C = 180° - (\angle A + \angle B)$ $\frac{1}{2}$

$\Rightarrow \angle Y = 45°$ $\frac{1}{2}$

OR

If the areas of two similar triangles are equal, show that they are congruent.

Sol. Let $\Delta ABC \sim \Delta PQR$

$\therefore \dfrac{ar(ABC)}{ar(PQR)} = 1 = \dfrac{AB^2}{PQ^2} = \dfrac{BC^2}{QR^2} = \dfrac{AC^2}{PR^2}$ 1

$\Rightarrow AB = PQ,\ BC = QR,\ AC = PR$ $\frac{1}{2}$

$\therefore \Delta ABC \cong \Delta PQR$ (SSS congruence rule) $\frac{1}{2}$

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26. How many two-digit numbers are divisible by 6?

Sol. Two digit numbers divisible by 6 are 12, 18, 24,...96 1

$96 = 12 + (n - 1) \times 6$ $\frac{1}{2}$

$\Rightarrow n = 15$ $\frac{1}{2}$

OR

In an A.P. it is given that common difference is 5 and sum of its first ten terms is 75. Find the first term of the A.P.

Sol. $S_{10} = 75$ and $n = 10$ $\frac{1}{2}$

$\frac{10}{2}(2a + 9 \times 5) = 75$ 1

$\Rightarrow a = -15$ $\frac{1}{2}$

SECTION C

Question numbers 27 to 34 carry 3 marks each.

27. One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting

(i) a king of red colour.

(ii) the queen of diamonds.

(iii) an ace.

Sol. Toal number of possible outcomes = 52

(i) P(Card is a king of Red colour) = $\frac{2}{52}$ or $\frac{1}{26}$ 1

(ii) P(card is a queen of diamonds) = $\frac{1}{52}$ 1

(iii) P(Card is an ace) = $\frac{4}{52}$ or $\frac{1}{13}$ 1

OR

A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find the probability that it bears

(i) a two-digit number.

(ii) a perfect square number.

(iii) a prime, number less than 15.

Sol. Total number of possible outcomes = 90

(i) P(a two digit number) = $\frac{81}{90}$ or $\frac{9}{10}$ 1

(ii) P(a perfect square number) = $\frac{9}{90}$ or $\frac{1}{10}$ 1

(iii) P(a prime number less than 15) = $\frac{6}{90}$ or $\frac{1}{15}$ 1

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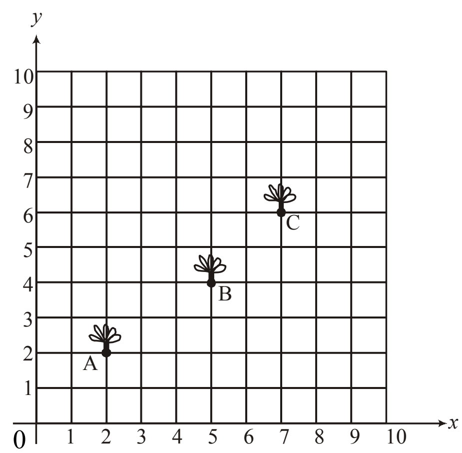
28. Seema has a 10 m × 10 m kitchen garden attached to her kitchen. She divides it into a 10 × 10 grid and wants to grow some vegetables and herbs used in the kitchen. She puts some soil and manure in that and sows a green chilly plant at A, a coriander plant at B and a tomato plant at C.

Her friend Kusum visited the garden and praised the plants grown there. She pointed out that they seem to be in a straight line. See the below diagram carefully and answer the following questions:



Figure

(i) Write the coordinates of the points A, B and C taking the 10 × 10 grid as coordinate axes.

(ii) By distance formula or some other formula, check whether the points are collinear.

Sol. (i) Coordinates of A, B and C are

(2, 2), (5, 4), (7, 6) $\frac{1}{2}+\frac{1}{2}+\frac{1}{2}$

(ii) Area of triangle = $\frac{1}{2}[2(4-6)+5(6-2)+7(2-4)]$ $\frac{1}{2}$

$= 1 \neq 0$ $\frac{1}{2}$

$\therefore$ Points are not collinear $\frac{1}{2}$

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29. Draw a circle of radius 4 cm. Take a point P at a distance of 8 cm from the centre and construct a pair of tangents from point P to the circle.

Sol. Drawing a circle of radius 4 cm and locating point P. 1

Correct construction of tangents. 2

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30. Prove that $\sqrt{3}$ is an irrational number.

Sol. Let $\sqrt{3}$ be a rational number.

Let $\sqrt{3} = \frac{p}{q}$, p, $q \neq 0$ are integers and coprime. $\frac{1}{2}$

$\Rightarrow p^2 = 3q^2 \Rightarrow p^2$ is divisible by 3.

$\Rightarrow$ p is divisible by 3. ...(i) 1

Let p = 3m, m is a positive integer.

$\therefore 9m^2 = 3q^2 \Rightarrow q^2$ is divisible by 3.

$\Rightarrow$ q is divisible by 3. ...(ii) 1

Using (i) and (ii), p and q are not coprime.

Which is contradiction.

Thus $\sqrt{3}$ is an irrational no. $\frac{1}{2}$

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31. In Figure-5, a chord AB of a circle of radius 10 cm subtends a right angle at the centre.

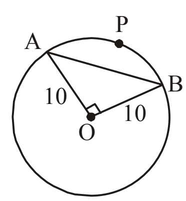

Figure 5

Find

(i) Area of sector OAPB

(ii) Area of minor segment APB. (Use π = 3.14)

Sol. (i) Area of sector OAPB $= \frac{90°}{360°} \times 3.14 \times 100 = 78.5 \text{ cm}^2$ $1\frac{1}{2}$

(ii) Area minor segment APB = Area sector OAPB – Area ΔOAB

$$= 78.5 - \frac{1}{2} \times 100$$ 1

$$= 28.5 \text{ cm}^2.$$ $\frac{1}{2}$

32. 5 pencils and 7 pens together cost ₹ 250 whereas 7 pencils and 5 pens together cost ₹ 302. Find the cost of one pencil and that of a pen.

Sol. Let the cost of 1 pencil be ₹ x and cost of 1 pen be ₹ y.

$5x + 7y = 250$ ...(i) 1

$7x + 5y = 302$ ...(ii) 1

Solving (i) and (ii)

$x = 36$ and $y = 10$ 1

Hence, cost of 1 pencil = ₹ 36

cost of 1 pen = ₹ 10

OR

Solve the following pair of equations using cross-multiplication method:

$\mathbf{x - 3y - 7 = 0}$

$\mathbf{3x - 5y - 15 = 0}$

Sol. $$\frac{x}{(-3)(-15)-(-5)(-7)} = \frac{y}{(-7)3-(-15)} = \frac{1}{-5-3(-3)}$$ $1\frac{1}{2}$

$$\Rightarrow \frac{x}{10} = \frac{y}{-6} = \frac{1}{4}$$ $\frac{1}{2}$

$$\Rightarrow x = \frac{5}{2}$$ $\frac{1}{2}$

$$\Rightarrow y = \frac{-3}{2}$$ $\frac{1}{2}$

33. Prove that:

$$(\text{cosec }\theta - \cot\theta)^2 = \frac{1-\cos\theta}{1+\cos\theta}$$

Sol. LHS = $(\text{cosec }\theta - \cot\theta)^2$

$$= \left(\frac{1}{\sin\theta} - \frac{\cos\theta}{\sin\theta}\right)^2 \quad 1$$

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

$$= \frac{(1-\cos\theta)^2}{(1-\cos\theta)\,(1+\cos\theta)} \quad 1$$

$$= \frac{1-\cos\theta}{1+\cos\theta} = \text{R.H.S.} \quad \frac{1}{2}$$

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34. In Figure-5, a circle is inscribed in a ΔABC touching BC, CA and AB at P, Q and R respectively. If AB = 10 cm, AQ = 7 cm, CQ = 5 cm, find the length of BC.

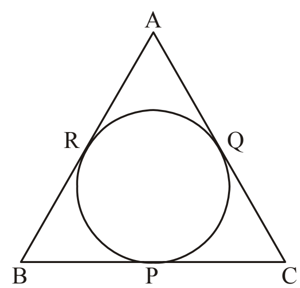

Figure 5

Sol. AR = AQ = 7 cm 1

BR = AB – AR = 10 – 7 = 3 cm $\frac{1}{2}$

BC = BP + PC

= BR + CQ 1

= 3 + 5 = 8 cm $\frac{1}{2}$

OR

In Figure-6, two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that $\angle PTQ = 2\angle OPQ$.

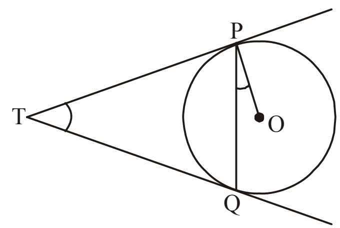

Figure 6

Sol. Let $\angle PTQ = \theta$

$\because$ TP = TQ

$\therefore \angle TPQ = \angle TQP = \frac{1}{2}(180° - q)$ 1

$= 90° - \frac{1}{2}\theta$ $\frac{1}{2}$

$\because \angle TPO = 90°$

$\therefore \angle OPQ = 90° - \left(90° - \frac{1}{2}\theta\right)$ 1

$= \frac{1}{2}\theta = \frac{1}{2}\angle PTQ$

$\Rightarrow \angle PTQ = 2\angle OPQ$ $\frac{1}{2}$

SECTION D

Question numbers 35 to 40 carry 4 marks each.

35. A bucket is in the form of a frustum of a cone of height 30 cm with the radii of its lower and upper circular ends as 10 cm and 20 cm respectively. Find the capacity of the bucket. (Use $\pi = 3.14$)

Sol. Capacity of bucket $= \frac{1}{3}ph(r_1^2 + r_2^2 + r_1r_2)$

$= \frac{1}{3} \times 3.14 \times 30(100 + 400 + 200)$ 2

$= 21980 \text{ cm}^3$ 2

OR

Water in a canal 6 m wide and 1.5 m deep, is flowing with a speed of 10 km/hr. How much area will it irrigate in 30 minutes if 4 cm of standing water is needed?

Sol. Length of canal covered by water in 30 min. = 5000 m 1

Volume of water flown in 30 min. = $6 \times 1.5 \times 5000 \text{ m}^3$ 1

Hence, $6 \times 1.5 \times 5000 = (\text{Area of field}) \times \frac{4}{100}$ 1

$\therefore$ Area of field = 1125000 m^2 1

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36. Draw a 'less than' ogive for the following distribution:

Classes:	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
Frequency:	8	5	7	14	18	6	2

Sol. Finding points (10, 8) (20, 13) (30, 20) (40, 34) (50, 52) (60, 58) (70, 60) 2

Plotting the points correctly and getting ogive. 2

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37. A train travels 360 km at a uniform speed. If the speed had been 5 km/hr more, it would have taken 1 hour less for the same journey. Find the original speed of the train.

Sol. Let original speed of the train be x km/h.

$\therefore \frac{360}{x} - \frac{360}{x+5} = 1$ 2

$\Rightarrow x^2 + 5x - 1800 = 0$ 1

$\Rightarrow (x + 45) \quad (x - 40) = 0$

$\Rightarrow x = 40$

$\therefore$ Speed of the train is 40 km/h 1

OR

Sum of the areas of two squares is 468 m^2. If the difference of their parameters is 24 m, find the sides of the two squares.

Sol. Let the side of squares be x m, y m (x > y)

$\therefore x^2 + y^2 = 468$ ...(i) 1

and $4(x - y) = 24$ ...(ii) 1

Simplify (i) and (ii) to get

$x^2 - 6x - 216 = 0$ 1

$\Rightarrow$ (x – 18) (x + 12) = 0

$\Rightarrow$ x = 18 $\frac{1}{2}$

and y = 12 $\frac{1}{2}$

$\therefore$ Sides of square are 18 m and 12 m.

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38. Divide polynomial – x^3 + $3x^2$ – 3x – 3x + 5 by the polynomial x^2 + x – 1 and verify the division algorithm.

Sol. On dividing $-x^3 + 3x^2 - 3x + 5$ by $x^2 + x - 1$

We get quotient = –x + 4

and Remainder = –8x + 9 2

Verification

$(x^2 + x - 1)(-x + 4) + (9 - 8x)$ 1

$= -x^3 - x^2 + x + 4x^2 + 4x - 4 + 9 - 8x$ $\frac{1}{2}$

$= -x^3 + 3x^2 - 3x + 5$ $\frac{1}{2}$

OR

Find other zeroes of the polynomial

$p(x) = 2x^4 - 3x^3 - 3x^2 + 6x - 2$

if two of its zeroes are $\sqrt{2}$ and $-\sqrt{2}$.

Sol. Two factors of p(x) are $\left(x-\sqrt{2}\right)$ and $\left(x+\sqrt{2}\right)$ $\frac{1}{2}$

g(x) = $\left(x+\sqrt{2}\right)$ and $\left(x-\sqrt{2}\right)$

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

Now, $\dfrac{2x^4 - 3x^3 - 3x^2 + 6x - 2}{x^2 - 2} = 2x^2 - 3x + 1$ 2

Also, $2x^2 - 3x + 1 = (2x - 1)(x - 1)$ $\frac{1}{2}$

Other zeroes are $\frac{1}{2}, 1$ $\frac{1}{2}$

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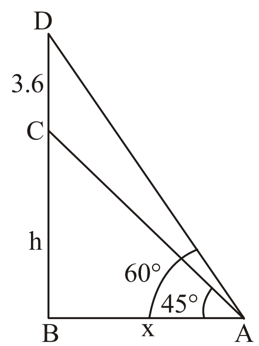
39. A statue 3.6 m tall, stands on top of a pedestal. From a point on the ground, the angle of elevation of the top of the statue is 60° and from the same point, the angle of elevation of the top of the pedestal is 45°. Find the height of the pedestal.

Sol.



Correct Figure 1

Let CD be the statue and BC be the pedestal.

$\tan 60° = \sqrt{3} = \frac{h+3.6}{x} \Rightarrow x = (h+3.6)/\sqrt{3}$ ...(i) 1

$\tan 45° = \frac{h}{x} = 1 \Rightarrow x = h$ ...(ii) 1

Solving (i) and (ii) to get

$h = \frac{3.6}{\sqrt{3}-1} = 1.8(\sqrt{3}+1)$ m

Height of the pedestal is $1.8(\sqrt{3}+1)$m 1

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40. In a right-angled triangle, prove that the square of the hypotenuse is equal to the sum of the squares of the remaining two sides.

Sol. For correct given, to prove, figure and construction. $4\times\frac{1}{2}=2$

Correct proof 2