Sample Paper-02
SUMMATIVE ASSESSMENT –II
MATHEMATICS
Class – X

Time allowed: 3 hours Maximum Marks: 90

General Instructions:

a) All questions are compulsory.
b) The question paper consists of 31 questions divided into four sections – A, B, C and D.
c) Section A contains 4 questions of 1 mark each which are multiple choice questions, Section B contains 6 questions of 2 marks each, Section C contains 10 questions of 3 marks each and Section D contains 11 questions of 4 marks each.
d) Use of calculator is not permitted.

Section A

1. 12 defective pens are accidently mixed with 132 good ones. It is not possible to just look at a pen and tell whether or not it is defective. One pen is taken out at random from this lot. Determine the probability that the pen taken out is a good one.
2. What is the area of the triangle formed by the points ***O*** (0, 0), ***A*** (-3, 0) and ***B*** (5, 0)?
3. If $a_5 = 5 - 11n$, find the common difference.
4. In two concentric circles prove that all chords of the outer circle which touch the inner circle are of equal length.

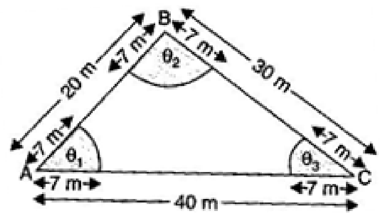
Section B

5. A brooch is made with silver wire in the form of a circle with diameter 35 mm. The wire is also used in making 5 diameters which divide the circle into 10 equal sectors as shown in figure. Find the total length of the silver wire required.
6. How many shots each having radius 3 cm can be made from a cubical lead solid of dimensions 49 cm x 36 cm x 22 cm?

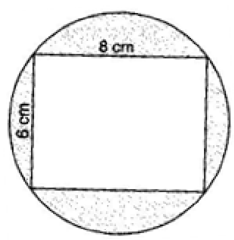
7. Three cubes of a metal whose edges are in the ratio 3 : 4 : 5 are melted and converted into a single cube of diagonal $24\sqrt{3}$ cm. Find the edges of the three cubes.
8. If 1 is a zero of the polynomial $p(x) = ax^2 - 3(a-1)x - 1,$ then find the value of a.
9. Is $\sqrt{3}, \sqrt{6}, \sqrt{9}, \ldots\ldots$ form an AP?
10. If a, b and c are the sides of a right angled triangle where c is the hypotenuse, then prove that the radius r of the circle which touches the sides of the triangle is given by $r = \frac{a+b-c}{2}$.

Section C

11. Find the area of the triangle formed by joining the mid–points of the sides of the triangle whose vertices are (0, –1), (2, 1) and (0, 3). Find the ratio of this area to the area of the given triangle
12. We know that median of a triangle divides it into two triangles of equal areas. Verify this result for △ABC whose vertices are A (4, –6), B (3, –2) and C (5, 2).
13. Three horses are tethered at 3 corners of a triangular plot having sides 20 m, 30 m, 40 m with ropes of 7 m length each. Find the area of the plot which can be grazed by the horses. $\left(\text{Use } \pi = \frac{22}{7}\right)$



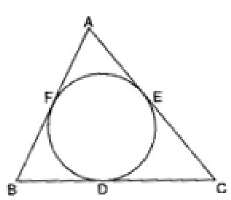
14. A rectangle 8 cm x 6 cm is inscribed in a circle as shown in figure. Find the area of the shaded region. $(\text{Use } \pi = 3.14)$



15. A solid iron rectangular block od dimensions 4.4 m x 2.6 m x 1 m is cast into a hollow cylindrical pipe of internal radius 30 cm and thickness 5 cm. Find the length of the pipe.
16. Solve the quadratic equation: $\sqrt{3}x^2 - 2\sqrt{2}x - 2\sqrt{3} = 0$
17. If the third and the ninth terms of an AP are 4 and –8 respectively, which term of this AP is zero?
18. A point P is 13 cm from the centre of the circle. The length of the tangent drawn from P to the circle is 12 cm. Find the radius of the circle.
19. From the top of a tower 96 m high, the angles of depression of two cars on a road at the same level as the base of the tower and on same side of it are θ and ϕ, where $\tan\theta = \frac{3}{4}$ and $\tan\phi = \frac{1}{3}$. Find the distance between the two cars.
20. A box contains 20 balls bearing numbers 1, 2, 3, 4, … 20. A ball is drawn at random from the box, what is the probability that the number on the ball is
    (i) an odd number
    (ii) divisible by 2 or 3
    (iii) prime number

Section D

21. Draw a circle of radius 3 cm. From a point 5 cm away from the centre of the circle, draw two tangents to the circle. Find the lengths of the tangents.
22. From a window (h m high above the ground) of a house in a street, the angles of elevation and depression of the top and foot of another house on the opposite side of the street are α and β respectively, show that the height of the opposite house is $h(1+\tan\alpha.\cot\beta)m$.
23. A card is drawn at random from a well-shuffled deck of playing cards. Find the probability that the card drawn is:
    (i) a king or a jack
    (ii) a non-ace
    (iii) a red card
    (iv) neither a king nor a queen.
24. Find the coordinates of the points which divides the line segment joining A(–2, 2) and B(2, 8) into four equal parts.
25. A bucket made up of metal sheet is in the form of frustum of a cone. Its depth is 24 cm and the diameters of the top and bottom are 30 cm and 10 cm respectively. Find the cost of milk which will completely fill the bucket at the rate Rs. 20 per litre and cost of metal sheet used if it costs Rs. 10 per 100cm^2. (use $\pi = 3.14$)
26. A milk container is in the form of a frustum of cone of height 18 cm with radius of its upper and lower ends as 8 cm and 32 cm respectively. Find the amount of milk which can completely fill the container and its cost at the rate of Rs.20 per litre. (Use π = 3.14)
27. A plane left 30 minutes later than the schedule time and in order to reach its destination 1500 km away in time it has to increase its speed by 250 km/hr from its usual speed. Find its usual speed.
28. Sum of the areas of two squares is 468 m^2. If the difference of their perimeters is 24 m, then find the sides of two squares.
29. Nidhi saves Rs. 2 on first day of the month, Rs. 4 on second day, Rs. 6 on third day and so on. Read the above passage and answer the following questions:
    (i) What will be her saving in the month of February?
    (ii) What value is depicted by Nidhi?
30. The incircle of Δ ABC touches the sides BC, CA and AB at D, E and F respectively. Show that:
    AF + BD + CD = AE + BF + CE = $\frac{1}{2}$(Perimeter of Δ ABC)



31. Prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact.
    Using the above result, prove the following:
    A tangent PQ at a point P of a circle of radius 5 cm meets a line through the centre of a point Q so that OQ = 13 cm. Find the length of PQ.

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(Solutions)

SECTION-A

1. Total number of favourable outcomes = 132 + 12 = 144
   Number of favourable outcomes = 132
   Hence, P (getting a good pen) = $\frac{132}{144} = \frac{11}{12}$
2. Area of ΔOAB = $\frac{1}{2}\left[0(0-0)-3(0-0)+5(0-0)\right] = 0$
   = Given points are collinear
3. We have $a_5 = 5-11n$
   Let d be the common difference
   $d = a_{n+1} - a_n$
   =5-11(n+1)-(5-11n)
   =5-11n-11-5+11n
   = -11
4. AB and CD are two chords of the circle which touch the inner circle at M and N.
   Respectively $\therefore OM = ON$
   $\Rightarrow AB = CD$ [$\because$ AB and CD are two chords of larger circle]
5. Diameter = 35 mm $\Rightarrow$ Radius = $\frac{35}{2}$ mm
   Circumference = $2\pi r$ = $2\times\frac{22}{7}\times\frac{35}{2}$ = 110 mm ………. (i)
   Length of 5 diameters = 35 x 5 = 175 mm ………. (ii)
   $\therefore$ Total length of the silver wire required = 110 + 175 = 285
6. Let n shots be made. Then,
   According to question,
   Volume of n shots = Volume of cuboid
   $\Rightarrow \quad n.\frac{4}{3} = \pi r^3 = 49\times36\times22$
   $\Rightarrow \quad n.\frac{4}{3}\times\frac{22}{7}.(3)^3 = 49\times36\times22 \quad \Rightarrow \quad n = \frac{49\times36\times22\times7\times3}{4\times22\times27} \quad \Rightarrow n = 363.4$
7. Let the edges of three cubes (in cm) be $3x, 4x$ and $5x$ respectively. Then,
   Volume of the cubes after melting = $(3x)^3 + (4x)^3 + (5x)^3$ = $216x^3$ cm^3
   Let the edge of the new cube be a cm. Then,

$a^3 = 216x^3 \quad \Rightarrow \quad a = 6x$

$\therefore$ Diagonal = $a\sqrt{3} = 6\sqrt{3}x$

And $6\sqrt{3}x = 24\sqrt{3} \quad \Rightarrow \quad x = 4$

Hence, the edges of the three cubes are 12 cm, 16 cm and 20 cm.

8. $p(1) = 0$

$\Rightarrow \quad a(1)^3 - 3(a-1)(1) - 1 = 0 \quad \Rightarrow \quad a - 3a + 2 = 0$

$\Rightarrow \quad -2a + 2 = 0 \quad \Rightarrow \quad a = 1$

9. $a_1 = \sqrt{3}, a_2 = \sqrt{6}, a_3 = \sqrt{9}$

$d_1 = \sqrt{6} - \sqrt{3}$

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

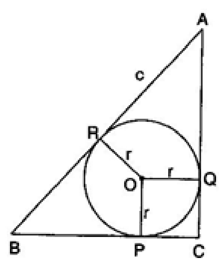
$d_2 = \sqrt{9} - \sqrt{6}$

$= 3 - \sqrt{6}$

Since $d_1 \neq d_2$

Hence, it is not an AP.

10. AB = AR + BR



$\Rightarrow \quad c$ = AQ + BP

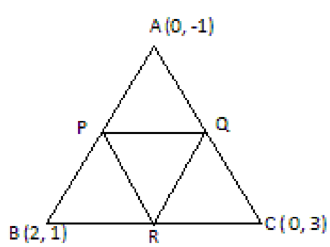
$\Rightarrow \quad c$ = (AC – CQ) + (BC – PC)

$\Rightarrow \quad c = (b - r) + (a - r)$

$\Rightarrow \quad c = a + b - 2r$

$\Rightarrow \quad r = \dfrac{a + b - c}{2}$

11. Let A = (0, –1) = (x_1, y_1), B = (2, 1) = (x_2, y_2) and C = (0, 3) = (x_3, y_3)



Area of $\triangle$ABC = $\frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$

⇒ Area of △ABC

$= \frac{1}{2}\left[0(1-3)+2\left\{3-(-1)\right\}+0(-1-1)\right] = \frac{1}{2}\times 8$

=4 sq. units

P, Q and R are the mid–points of sides AB, AC and BC respectively.

Applying Section Formula to find the vertices of P, Q and R, we get

$P = \frac{0+2}{2}, \frac{1-1}{2} = (1,0)$

$Q = \frac{0+0}{2}, \frac{-1+3}{2} = (0,1)$

$R = \frac{2+0}{2}, \frac{1+3}{2} = (1,2)$

Applying same formula, Area of △PQR= $\frac{1}{2}\left[1(1-2)+0(2-0)+1(0-1)\right] = \frac{1}{2}|-2|$

=1 sq. units (numerically)

Now, $\frac{Area\ of\ \Delta PQR}{Area\ of\ \Delta ABC} = \frac{1}{4} = 1:4$

12. We have △ABC whose vertices are given.

We need to show thatar(△ABD) = ar(△ACD).

Let coordinates of point D are (x, y)

Using section formula to find coordinates of D, we get

$x = \frac{3+5}{2} = \frac{8}{2} = 4$

$y = \frac{-2+2}{2} = \frac{0}{2} = 0$

Therefore, coordinates of point D are (4, 0)

Using formula to find area of triangle:

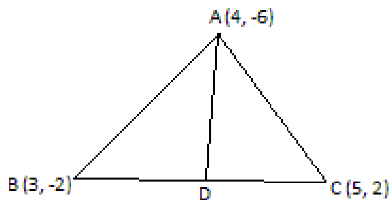
Area of △ABD = $\frac{1}{2}[x_1(y_2-y_3)+x_2(y_3-y_1)+x_3(y_1-y_2)]$

$= \frac{1}{2}\left[4(-2-0)+3\left\{0-(-6)\right\}+4\{-6-(-2)\}\right]$

$= \frac{1}{2}(-8+18-16) = \frac{1}{2}(-6) = -3\,sq\ units$

Area cannot be in negative.

Therefore, we just consider its numerical value.



Therefore, area of △ABD = 3 sq units ... (1)

Again using formula to find area of triangle:

Area of △ACD = $\frac{1}{2}[x_1(y_2-y_3)+x_2(y_3-y_1)+x_3(y_1-y_2)]$

= ½ [4(2−0)+5 {0−(−6)} +4 {−6−2)}]

= ½ (8+30−32)= ½ (6)=3 sq units ... (2)

From (1) and (2), we getar(△ABD) = ar(△ACD)

Hence Proved

13. Required area,

$= \pi r^2 \frac{\theta_1}{360°} + \pi r^2 \frac{\theta_2}{360°} + \pi r^2 \frac{\theta_3}{360°}$

$= \frac{\pi r^2}{360°}(\theta_1+\theta_2+\theta_3)$

$= \frac{\pi r^2}{360°}(180°)$ [$\because$ Sum of all the angles of a triangle is 180°]

$= \frac{22}{7} \times 7 \times 7 \times \frac{180°}{360°}$

= 77 m^2

14. Diagonal of the rectangle = $\sqrt{8^2+6^2} = \sqrt{64+36} = \sqrt{100} = 10$ cm

∴ Radius of the circle = $\frac{10}{2}$ = 5 cm

∴ Area of the circle = $\pi.5^2$ = 3.14 x 5 x 5 = 78.5 cm^2

∴ Area of rectangle = 8 x 6 = 48 cm^2

∴ Required area = 78.5 – 48 = 30.5 cm^2

15. Let the length of the pipe be x cm.

According to question,

Volume of hollow cylinder = Volume of rectangular block

⇒ $\pi(r_1^2 - r_2^2)h - l \times b \times h$

⇒ $\pi[(30+5)^2 - (30)^2]x =$ 4.4 x 2.6 x 1 x 100 x 100 x 100

⇒ $3.14[1225-900]x =$ 11.44 x 1000000

⇒ 1020.5.x = 11440000

⇒ x = 112 m

16. $\sqrt{3}x^2 - 2\sqrt{2}x - 2\sqrt{3} = 0$ $\Rightarrow$ $\sqrt{3}x^2 - 3\sqrt{2}x + \sqrt{2}x - 2\sqrt{3} = 0$

$\Rightarrow$ $\sqrt{3}x\left(x - \sqrt{3}\sqrt{2}\right) + \sqrt{2}\left(x - \sqrt{2}\sqrt{3}\right) = 0$

$\Rightarrow$ $\left(x - \sqrt{6}\right)\left(\sqrt{3}x + \sqrt{2}\right) = 0$

$\Rightarrow$ $x = \sqrt{6}, \frac{-\sqrt{2}}{\sqrt{3}}$

17. It is given that 3rd and 9th term of AP are 4 and –8 respectively.

It means $a_3 = 4 \, and \, a_9 = -8$

Using formula $a_n = a + (n-1)d$, to find nth term of arithmetic progression,

4 = a + (3 – 1)d And, –8 = a + (9 – 1)d

$\Rightarrow$ $4 = a + 2d$ And, $-8 = a + 8d$

These are equations in two variables.

Using equation $4 = a + 2d$, we can say that $a = 4 - 2d$

Putting value of a in other equation $-8 = a + 8d$,

$-8 = 4 - 2d + 8d$

$\Rightarrow$ $-12 = 6d$ $\Rightarrow$ $d = -2$

Putting value of d in equation $-8 = a + 8d$,

$-8 = a + 8(-2)$ $\Rightarrow$ $-8 = a - 16$ $\Rightarrow$ $a = 8$

Therefore, first term $= a = 8$ and Common Difference $= d = -2$

We want to know which term is equal to zero.

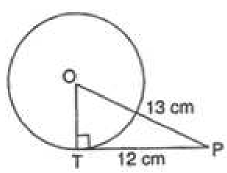
Using formula $a_n = a + \left(n-1\right)d$, to find nth term of arithmetic progression,

$0 = 8 + (n-1)(-2)$ $\Rightarrow$ $0 = 8 - 2n + 2$ $\Rightarrow$ $0 = 10 - 2n$

$\Rightarrow$ $2n = 10$ $\Rightarrow$ $n = 5$

Therefore, 5thterm is equal to 0.

18. $OT^2 = OP^2 - PT^2$ [By Pythagoras theorem]



$\Rightarrow$ $OT^2 = 13^2 - 12^2 = 169 - 144 = 25$

$\Rightarrow$ OT = 5 cm

19. In right ΔABC,

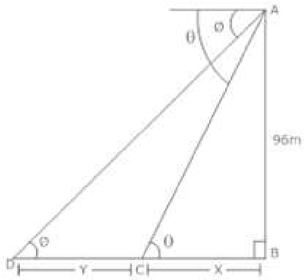
$\frac{96}{x} = \tan\theta$

$\Rightarrow \frac{96}{x} = \frac{3}{4}$

$\Rightarrow x = \frac{96 \times 4}{3}$ $[\tan\theta = \frac{3}{4}$

$\Rightarrow x = 32 \times 4 = 128m$

In right ΔABD,



$$\frac{96}{x+y} = \tan\phi$$

$$\Rightarrow \frac{96}{x+y} = \frac{1}{3} \quad [\because \tan\phi = \frac{1}{3}$$

$$\Rightarrow \frac{96}{128+y} = \frac{1}{3}$$

$$\Rightarrow 128 + y = 228$$

$$\Rightarrow y = 288 - 128 = 160m$$

20. Total number of outcomes = 20

(i) Favorable outcomes are 1,3,5,7,9,11,13,15,17,19 i.e., 10 in number.

$\therefore$ Required probability = $\frac{10}{20} = \frac{1}{2}$

(ii) Number "divisible by 2" are 2,4,6,8,10,12,14,16,18,20 i.e., 10 in number

Numbers "divisible by 3 are 3,6,9,12,15,18. i.e., 6 in number

Numbers "divisible by 2 or 3 are 6,12,18 i.e., 3 in number.

$\therefore$ Numbers divisible by "2 or 3"=10+6 – 3=13

Favourable outcomes = 13

$\therefore$ Required probability = $\frac{13}{20}$

(iii) Prime numbers are 2,3,5,7,11,13,17,19 i.e., 8 in number

Favourable outcomes = 8

21. Let $\angle$APB = θ

(a) Draw a circle with O as centre and radius equal to 3 cm.

(b) Draw OP = 5 cm and bisect it. Let M be the mid-point of OP.

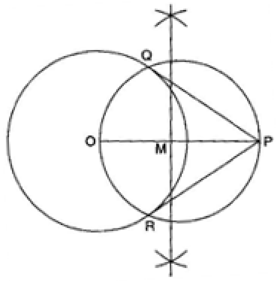
(c) Taking M as centre and OM as radius , draw a circle. Let it intersect the given circle at Q and R.

(d) Join PQ and PR.

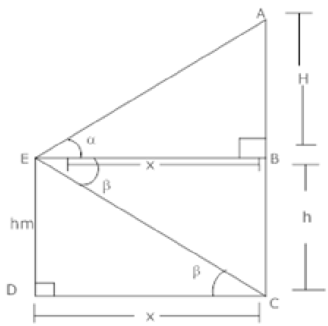
Then PQ and PR are the required two tangents.

On measurement,

PQ = PR = 4 cm



22. Let DE = h m
DC = x m



In right ΔEDC,

$$\frac{h}{x} = \tan\beta$$

$$\Rightarrow \frac{h}{\tan\beta} = x ......(i)$$

In right ΔABE,

$$\frac{H}{x} = \tan\alpha$$

$$\Rightarrow \frac{H}{\frac{h}{\tan\beta}} = \tan\alpha \text{ [from (i)]}$$

$$\Rightarrow H\tan\beta = h\tan\alpha$$

$$\Rightarrow H = h\tan\alpha.\cot\beta$$

$$AC = H + h$$

$$= h\tan\alpha.cot\beta + h$$

$$= h\left(\tan\alpha.\cot\beta + 1\right)$$

Hence Proved.

23. Total number of cards in the deck = 52
$\therefore$ Number of all possible outcomes = 52
(i) Number of a king or a jack = 4 + 4 = 8
$\therefore$ Required probability = $\frac{8}{52} = \frac{2}{13}$
(ii) Number of a non-ace = 52 – 4 = 48

∴ Required probability = $\frac{42}{52}=\frac{12}{13}$

(iii) Number of a red card = 13 + 13= 26

∴ Required probability = $\frac{26}{52}=\frac{1}{2}$

(iv) Number of neither a king nor a queen = 52 – (4 + 4) = 4

∴ Required probability = $\frac{44}{52}=\frac{11}{13}$

24. A = (–2, 2) and B = (2, 8)

Let P, Q and R are the points which divide line segment AB into 4 equal parts.

Let coordinates of point P =(x_1, y_1), Q =(x_2, y_2) and R =(x_3, y_3)

We know AP = PQ = QR = RS.

It means, point P divides line segment AB in 1:3.

Using Section formula to find coordinates of point P, we get

$$x_1=\frac{(-2)\times3+2\times1}{1+3}=\frac{-6+2}{4}=\frac{-4}{4}=-1$$

$$y_1=\frac{2\times3+8\times1}{1+3}=\frac{6+8}{4}=\frac{14}{4}=\frac{7}{2}$$

Since, AP = PQ = QR = RS.

It means, point Q is the mid-point of AB.

Using Section formula to find coordinates of point Q, we get

$$x_2=\frac{(-2)\times1+2\times1}{1+1}=\frac{-2+2}{2}=\frac{0}{2}=0$$

$$y_2=\frac{2\times1+8\times1}{1+1}=\frac{2+8}{2}=\frac{10}{2}=5$$

Because, AP = PQ = QR = RS.

It means, point R divides line segment AB in 3:1

Using Section formula to find coordinates of point P, we get

$$x_3=\frac{(-2)\times1+2\times3}{1+3}=\frac{-2+6}{4}=\frac{4}{4}=1$$

$$y_3=\frac{2\times1+8\times3}{1+3}=\frac{2+24}{4}=\frac{26}{4}=\frac{13}{2}$$

Therefore, P=(–1, $\frac{7}{2}$), Q= (0, 5)and R =(1, $\frac{13}{2}$)

Volume of horizontal cuboid = lbh

= 22 x (8 + 2) x 3 = 22 x 10 x 3 = 660 cm^3

Volume of vertical cuboid = lbh

= 22 x 2 x 5 = 220 cm^3

∴ Total volume of piece

= 660 cm^3 + 220 cm^3

= 1180 cm^3

25. $h = 24\,cm,\ r_1 = \frac{30}{2} = 15\,cm,\ r_2 = \frac{10}{2} = 5\,cm$

$l = \sqrt{h^2 + (r_1 - r_2)} = \sqrt{24^2 + (15-5)^2}$

$= \sqrt{576+100} = \sqrt{676} = 26cm$

(i) Volume of bucket $= \frac{1}{3}\pi h\left(r_1^2 + r_2^2 + r_1 r_2\right)$

$= \frac{1}{3} \times 3.14 \times 24\left(15^2 + 5^2 + 15 \times 5\right)$

$= 3.14 \times 8(225 + 25 + 75) = 8164 cm^3$

$\therefore$ Quantity of milk = $\frac{8164}{1000} = 8.164$ litres

Cost of 1 litre of milk = Rs.20

$\therefore$ Cost of 8.164 litres milk = Rs. 20 × 8.14

= Rs. 163.28

(ii) T.S.A. of bucket (excluding the upper end)

$= \pi l\left(r_1 + r_2\right) + \pi r_2^{\ 2} = 3.14 \times 26(15+5) + 3.14 \times 5^2$

$= 1632.8 + 78.5 = 1711.3 cm^2$

Cost of 100 cm^2 metal sheet = Rs.10

$\therefore$ Cost of 1711.3 cm^2 metal sheet = $\frac{1711.3 \times 10}{100} = Rs.171.13$

26. Given, $h =$ 18 cm

r_1 = 32 cm

r_2 = 8 cm

According to the question,

Amount of milk = Volume of frustum

$\Rightarrow$ Volume of frustum = $\frac{1}{3}\pi h\left(r_1^2 + r_2^2 + r_1 r_2\right)$

$= \frac{1}{3} \times 3.14 \times 18\left[(32)^2 + (8)^2 + 32 \times 8\right]$

$= \frac{3.14 \times 18}{3}(1024 + 64 + 256)$

$= \frac{3.14}{3} \times 18 \times 1344$ = 25320.96 cm^3

Cost of milk = $\frac{25320.96 \times 20}{1000}$ = $\frac{506419.2}{1000}$ = Rs. 506.42

27. Let usual speed = x km/hr

New speed $= (x + 250)$ km/hr

Total distance = 1500 km

Time taken by usual speed = $\frac{1500}{x}$ hr

Time taken by new speed = $\frac{1500}{x+250}$ hr

According to question,

$$\frac{1500}{x} - \frac{1500}{x+250} = \frac{1}{2}$$

$$\Rightarrow \frac{1500x + 1500 \times 250 - 1500x}{x^2 + 250x} = \frac{1}{2}$$

$$\Rightarrow x^2 + 250x = \frac{1500 \times 250}{2}$$

$$\Rightarrow x^2 + 250x = 750000$$

$$\Rightarrow x^2 + 250x - 750000 = 0$$

$$\Rightarrow x^2 + 1000x - 750x - 750000 = 0$$

$$\Rightarrow x(x+1000) - 750(x+1000) = 0$$

$$\Rightarrow x = 750 \; or \; x = -1000$$

Therefore, usual speed is 750 km/hr, -1000 is neglected.

28. Let the side of the larger square be x m. Then its perimeter = $4x$ m

Perimeter of the larger square – Perimeter of the smaller square = 24 m

$\Rightarrow$ $4x -$ Perimeter of the smaller square = 24

$\Rightarrow$ Perimeter of the smaller square = $(4x - 24)$ m

$\Rightarrow$ Side of the smaller square = $\frac{4x-24}{4} = (x-6)$ m

According to the question,

Area of the larger square + Area of the smaller square = 468 m²

$\Rightarrow x^2 + (x-6)^2 = 468$ $\qquad \Rightarrow x^2 + x^2 - 12x - 432 = 0$

$\Rightarrow 2x^2 - 12x - 432 = 0$ $\qquad \Rightarrow x^2 - 6x - 216 = 0$

$\Rightarrow x^2 - 18x + 12x - 216 = 0$ $\qquad \Rightarrow x(x-18) + 12(x-18) = 0$

$\Rightarrow (x-18)(x+12) = 0$ $\qquad \Rightarrow x = 18, -12$

$x = -12$ is inadmissible as x is the length of a side which cannot be negative.

$\therefore$ $x = 18$ and $x - 6 = 12$

Hence, the sides of the two squares are 18 m and 12 m.

29. (i) Nidhi saves on first day = Rs.2, on second day = Rs.4, on third day = Rs.4 and so on.

Thus, savings form an AP, whose first term $a = 2$

Common difference (d) = 4 – 2 = 2

We know that year 2012 is a leap year. So there are 29 days in month of February.

So, we have to find her savings in 29 days, i.e. $n = 29$

Now, $S_n = \frac{n}{2}\left[2a+(n-1)d\right]$

$\Rightarrow$ $S_{29} = \frac{29}{2}\left[2\times2+(29-1)2\right]$ = $\frac{29}{2}[4+28\times2]$

= $\frac{29}{2}\times60$ = 870

30. $\because$ Tangent segments from an external point to a circle are equal in length.

$\therefore$ $\therefore$ AE = AF BF = BD CD = CE

$\Rightarrow$ AF + BD + CD = AE + BF + CE ……….(i)

Also, Perimeter of Δ ABC

= AB + BC + CA

= (AF + BF) + (BD + CD) + (CE + AE)

= (AF + BD + CD) + (AE + BF + CE)

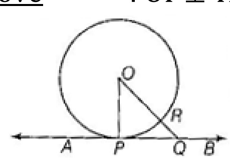
= 2(AF + BD + CD) [From eq. (i)]

= 2(AE + BF + CE)

$\therefore$ Perimeter of Δ ABC = 2 (AE + BF + CE)

31. **First part**:Given : A circle with centre O and radius r and a tangent AB at a point P.

To Prove : OP $\perp$ AB



Construction: Take any point Q, other than P on the tangent AB. Join OQ. Suppose OQ meets the circle at R.

Proof :Clearly OP = OQ [Radii]

Now, OQ = OR + RQ

$\Rightarrow$ OQ> OR

$\Rightarrow$ OQ> OP [OP = OQ]

$\Rightarrow$ OP <OQ

Thus, OP is shorter than any segment joining O to any point of AB.

So, OP is perpendicular to AB.

Hence,

OT = OT' ……. (Radii of the same circle)

and OP = OP ……..(Common)

$\therefore$ Δ OTP $\cong$ Δ OT'P ……..(RHS congruency)

Hence, OP $\perp$ AB

Second part: Using the above, we get,

$\angle$OPQ = 90°

$\therefore$ PQ = $\sqrt{OQ^2 - OP^2}$ [By Pythagoras theorem]

$\Rightarrow$ PQ = $\sqrt{13^2-5^2}$ = 12 cm