Secondary School Examination - 2020
Marking Scheme- MATHEMATICS BASIC
Subject Code : 241 Paper Code: 430/1/1,2,3

General Instructions:

1. You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully.**Evaluation is a 10-12 days mission for all of us. Hence, it is necessary that you put in your best effortsin this process.**

2. Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one's own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed. **However, while evaluating, answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and marks be awarded to them. In class-X, while evaluating two competency based questions, please try to understand given answer and even if reply is not from marking scheme but correct competency is enumerated by the candidate, marks should be awarded.**

3. The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.

4. Evaluators will mark(√) wherever answer is correct. For wrong answer 'X"be marked. Evaluators will not put right kind of mark while evaluating which gives an impression that answer is correct and no marks are awarded. **This is most common mistake which evaluators are committing.**

5. If a question has parts, please award marks on the right-hand side for each part. Marks awarded for different parts of the question should then be totaled up and written in the left-hand margin and encircled. This may be followed strictly.

6. If a question does not have any parts, marks must be awarded in the left-hand margin and encircled. This may also be followed strictly.

7. If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out.

8. No marks to be deducted for the cumulative effect of an error. It should be penalized only once.

9. A full scale of marks 0 - 80 has to be used. Please do not hesitate to award full marks if the answer deserves it.

10. Every examiner has to necessarily do evaluation work for full working hours i.e. 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines).

11. Ensure that you do not make the following common types of errors committed by the Examiner in the past:-

- Leaving answer or part thereof unassessed in an answer book.

- Giving more marks for an answer than assigned to it.

- Wrong totaling of marks awarded on a reply.

- Wrong transfer of marks from the inside pages of the answer book to the title page.

- Wrong question wise totaling on the title page.

- Wrong totaling of marks of the two columns on the title page.

- Wrong grand total.

- Marks in words and figures not tallying.

- Wrong transfer of marks from the answer book to online award list.

- Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.)

- Half or a part of answer marked correct and the rest as wrong, but no marks awarded.

12. While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0)Marks.

13. Any unassessed portion, non-carrying over of marks to the title page, or totaling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously.

14. The Examiners should acquaint themselves with the guidelines given in the Guidelines for spot Evaluation before starting the actual evaluation.

15. Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totaled and written in figures and words.

16. The Board permits candidates to obtain photocopy of the Answer Book on request in an RTI application and also separately as a part of the re-evaluation process on payment of the processing charges.

QUESTION PAPER CODE 430/1/1
EXPECTED ANSWER/VALUE POINTS

SECTION A

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1. HCF of 144 and 198 is

(a) 9   (b) 18   (c) 6   (d) 12

Sol. (b) 18   1

---

2. The median and mode respectively of a frequency distribution are 26 and 29. Then its mean is

(a) 27.5   (b) 24.5   (c) 28.4   (d) 25.8

Sol. (b) 24.5   1

---

3. In Fig. 1, on a circle of radius 7 cm, tangent PT is drawn from a point P such that PT = 24 cm. If 0 is the centre of the circle, then the length of PR is

Fig. 1

(a) 30 cm   (b) 28 cm   (c) 32 cm   (d) 25 cm

Sol. (c) 32 cm   1

---

4. 225 can be expressed as

(a) 5×3^2 (b) $5^2 \times 3$ (c) $5^2 \times 3^2$ (d) $5^3 \times 3$

Sol. (d) $5^2 \times 3^2$ 1

---

5. The probability that a number selected at random from the numbers 1, 2, 3, ..., 15 is a multiple of 4 is

(a) $\dfrac{4}{15}$ (b) $\dfrac{2}{15}$ (c) $\dfrac{1}{15}$ (d) $\dfrac{1}{5}$

Sol. (d) $\dfrac{1}{5}$ 1

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6. If one zero of a quadratic polynomial $(kx^2 + 3x + k)$ is 2, then the value of k is

(a) $\dfrac{5}{6}$ (b) $-\dfrac{5}{6}$ (c) $\dfrac{6}{5}$ (d) $-\dfrac{6}{5}$

Sol. (d) $-\dfrac{6}{5}$ 1

---

7. $2.\overline{35}$ is

    (a) an integer   **(b) a rational number**

    (c) an irrational number   **(d) a natural number**

Sol. (b) a rational number   1

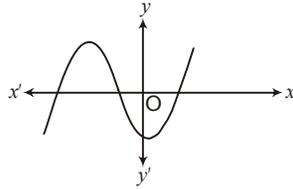**8.** **The graph of a polynomial is shown in Fig. 2, then the number of its zeroes is**

Fig. 2

    (a) 3   **(b) 1**   **(c) 2**   **(d) 4**

Sol. (a) 3   1

---

9. **Distance of point P(3, 4) from x-axis is**

    (a) 3 units   **(b) 4 units**   **(c) 5 units**   **(d) 1 unit**

Sol. (b) 4 units   1

---

10. **If the distance between the points A(4, p) and B(1, 0) is 5 units, then the value(s) of p is (are)**

    (a) 4 only   **(b) –4 only**   **(c) ±4**   **(d) 0**

Sol. (c) ±4   1

Q. Nos. 11 to 15, fill in the blanks.

11. **If the point C(k, 4) divides the line segment joining two points A(2, 6) and B(5, 1) in ratio 2 : 3, the value of k is _____ .**

Sol. $\dfrac{16}{5}$ 1

OR

If points A(–3, 12), B(7, 6) and C(x, 9) are collinear, then the value of x is_____ .

Sol. 2   1

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12. **If the equations kx – 2y = 3 and 3x + y = 5 represent two intersecting lines at unique point, then the value of k is _____ .**

Sol. $\neq -6$ 1

OR

If quadratic equation $3x - 4x + k = 0$ has equal roots, then the value of k is _____.

Sol. $\dfrac{4}{3}$
<div align="right">1</div>

---

13. The value of $(\sin 20° \cos 70° + \sin 70° \cos 20°)$ is _____.

Sol. 1
<div align="right">1</div>

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14. If $\tan(A + B) = \sqrt{3}$ and $\tan(A - B) = \dfrac{1}{\sqrt{3}}$, $A > B$, then the value of A is _____.

Sol. 45°
<div align="right">1</div>

---

15. The perimeters of two similar triangles are **25 cm** and **15 cm** respectively. If one side of the first triangle is **9 cm**, then the corresponding side of second triangle is _____.

Sol. $\dfrac{27}{6}$ cm or 5.4 cm
<div align="right">1</div>

In Q. Nos. 16 to 20, answer the following.

16. If $5 \tan \theta = 3$, then what is the value of $\left(\dfrac{5 \sin \theta - 3 \cos \theta}{4 \sin \theta + 3 \cos \theta}\right)$?

Sol. $\dfrac{5 \tan \theta - 3}{4 \tan \theta + 3}$
<div align="right">$\frac{1}{2}$</div>

$= 0$
<div align="right">$\frac{1}{2}$</div>

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17. The areas of two circles are in the ratio 9 : 4, then what is the ratio of their circumferences?

Sol. $\dfrac{r_1^2}{r_2^2} = \dfrac{9}{4} \Rightarrow \dfrac{r_1}{r_2} = \dfrac{3}{2}$
<div align="right">$\frac{1}{2}$</div>

$\therefore \dfrac{2\pi r_1}{2\pi r_2} = \dfrac{3}{2}$ or $3:2$
<div align="right">$\frac{1}{2}$</div>

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18. If a pair of dice is thrown once, then what is the probability of getting a sum of 8?

Sol. Favourable outcomes are

(3, 5); (4, 4); (5, 3); (2, 6); (6, 2) i.e., 5
<div align="right">$\frac{1}{2}$</div>

$P \text{ (Sum 8)} = \dfrac{5}{36}$
<div align="right">$\frac{1}{2}$</div>

19. In Fig. 3, in ΔABC, DE || BC such that AD = 2.4 cm, AB = 3.2 cm and AC = 8 cm, then what is the length of AE?
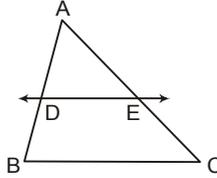
Fig. 3

Sol. $\dfrac{AD}{AB} = \dfrac{AE}{AC}$ or $\dfrac{2.4}{3.2} = \dfrac{AE}{8}$ $\qquad\qquad$ $\dfrac{1}{2}$

AE = 6 cm $\qquad\qquad$ $\dfrac{1}{2}$

20. The nth term of an AP is (7 − 4n), then what is its common difference?

Sol. $T_1 = 3$, $T_2 = -1$ $\qquad\qquad$ $\dfrac{1}{2}$

d = −4 $\qquad\qquad$ $\dfrac{1}{2}$

SECTION B

Q. Nos, 21 to 26 carry two marks each.

21. A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball at random from the bag is three times that of a red ball, find the number of blue balls in the bag.

Sol. Let number of blue balls = x

Total balls = 5 + x $\qquad\qquad$ $\dfrac{1}{2}$

P(blue ball) = $\dfrac{x}{5+x}$ and P(Red balls) = $\dfrac{5}{5+x}$ $\qquad\qquad$ 1

∴ $\dfrac{x}{5+x} = \dfrac{3(5)}{5+x}$

⟹ x = 15

∴ Number of blue balls = 15 $\qquad\qquad$ $\dfrac{1}{2}$

22. **Prove that** $\sqrt{\dfrac{1-\sin\theta}{1+\sin\theta}} = \sec\theta - \tan\theta.$

Sol. L.H.S. $= \sqrt{\dfrac{1-\sin\theta}{1+\sin\theta}} \cdot \sqrt{\dfrac{1-\sin\theta}{1-\sin\theta}}$ 　　　　　　　　　1

$= \dfrac{1-\sin\theta}{\cos\theta} = \sec\theta - \tan\theta$ 　　　　　　　　　1

OR

Prove that $\dfrac{\tan^2\theta}{1+\tan^2\theta} + \dfrac{\cot^2\theta}{1+\cot^2\theta} = 1.$

L.H.S. $= \dfrac{\tan^2\theta}{\sec^2\theta} + \dfrac{\cot^2\theta}{\cos ec^2\theta}$ 　　　　　　　　　1

$= \sin^2\theta + \cos^2\theta$

$= 1$ 　　　　　　　　　1

23. **Two different dice are thrown together, find the probability that the sum of the numbers appeared is less than 5.**

Sol. Total number of possible outcomes = 36

Favourable outcomes are = (1, 1); (1, 2); (1, 3); (2, 1); (2, 2)

(3, 1) i.e. 6 　　　　　　　　　1

P(sum of numbers less than five) $= \dfrac{6}{36}$ or $\dfrac{1}{6}$ 　　　　　　　　　1

OR

Find the probability that 5 Sundays occur in the month of November of a randomly selected year.

Number of days of November = 30

$= 4 \text{ weeks} + 2 \text{ days}$ 　　　　　　　　　1

P (5 sudays) $= \dfrac{2}{7}$ 　　　　　　　　　1

24. In Fig. 4, a circle touches all the four sides of a quadrilateral ABCD. If AB = 6 cm, BC = 9 cm and CD = 8 cm, then the find length of AD.
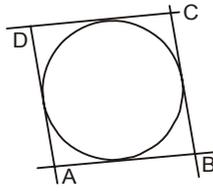
Fig. 4

Sol. The sides of quadrilateral touches a circle

AB + DC = BC + AD   1

6 + 8 = 9 + AD

$\Rightarrow$ AD = 5 cm   1

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25. The perimeter of a sector of a circle with radius 6.5 cm is 31 cm, then find the area of the sector.

Sol.
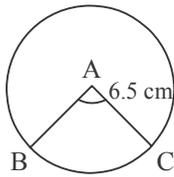
$AB + \overset{\frown}{BC} + AC = 31$ cm

$\Rightarrow \overset{\frown}{BC} = (31 - 13)$ cm

$l = 18$ cm $\frac{1}{2}$

$A = \dfrac{1}{2} l r$

$= \dfrac{1}{2} \times 18 \times 6.5$ cm^2 1

$= 58.5$ cm^2 $\frac{1}{2}$

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26. Divide the polynomial $(4x^2 + 4x + 5)$ by $(2x + 1)$ and write the quotient and the remainder.

Sol.

$$\begin{array}{r} 2x+1 \\ 2x+1\overline{\smash{\big)}\,4x^2+4x+5} \\ \underline{4x^2+2x} \\ {}-\quad - \\ \overline{2x+5} \\ 2x+1 \\ \underline{-\quad +} \\ 4 \end{array}$$
     1

Quotient = 2x + 1, Remainder = 4 $\frac{1}{2} + \frac{1}{2}$

SECTION C

Q. Nos. 27 to 34 carry 3 marks each.

27. **If α and β are the zeroes of the polynomial f(x) = x² – 4x - 5 then find the value of α² + β².**

Sol. $\alpha + \beta = \dfrac{4}{1};\ \alpha\beta = -5$ <div style="text-align:right">1</div>

$\alpha^2 + \beta^2 = (\alpha+\beta)^2 - 2\alpha\beta$

$= 16 + 10$ <div style="text-align:right">1</div>

$= 26$ <div style="text-align:right">1</div>

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28. **Draw a circle of radius 4 cm. From a point 7 cm away from the centre of circle. Construct a pair of tangents to the circle.**

Sol. Constructing the circle of given radius <div style="text-align:right">1</div>

Constructing the tangents <div style="text-align:right">2</div>

OR

Draw a line segment of 6 cm and divide it in the ratio 3 : 2.

Drawing line segment of length 6 cm. <div style="text-align:right">1</div>

Dividing it in the ratio 3 : 2. <div style="text-align:right">2</div>

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29. **A solid metallic cuboid of dimension 24 cm × 11 cm × 7 cm is melted and recast into solid cones of base radius 3.5 cm and height 6 cm. Find the number of cones so formed**

Sol. Volume of metallic cuboid = (24 × 11 × 7) cm³ <div style="text-align:right">1/2</div>

Volume of Cone = $\dfrac{1}{3}\pi \cdot r^2 \cdot h$

$= \dfrac{1}{3}\pi\left(\dfrac{7}{2}\right)^2 \cdot 6$ <div style="text-align:right">1/2</div>

No. of Cones $= \dfrac{24 \times 11 \times 7}{\dfrac{1}{3} \times \dfrac{22}{7} \times \dfrac{7}{2} \times \dfrac{7}{2} \times 6}$ <div style="text-align:right">1</div>

$= 24$ <div style="text-align:right">1</div>

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30. **Prove that (1 + tan A – sec A) × (1 + tan A + sec A) = 2 tan A**

Sol. L.H.S. $= (1 + \tan A)^2 - \sec^2 A$ <div style="text-align:right">1</div>

$= 1\ \tan^2 A + 2 \tan A - \sec^2 A$ <div style="text-align:right">1</div>

$$= \sec^2 A + 2\tan A - \sec^2 A$$

$$= 2 \tan A = \text{R.H.S.}$$ 1

OR

Prove that $\dfrac{\textbf{cosec } \theta}{\textbf{cosec } \theta - 1} + \dfrac{\textbf{cosec } \theta}{\textbf{cosec } \theta + 1} = \textbf{2 sec}^2 \, \theta$

L.H.S. $= \dfrac{\cos ec\,\theta(\cos ec\,\theta + 1) + \cos ec\,\theta(\cos ec\,\theta - 1)}{\cos ec^2\,\theta - 1}$ 1

$= \dfrac{2\cos ec^2\theta}{\cot^2 \theta}$ 1

$= 2 \sec^2 \theta = \text{R.H.S.}$ 1

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31. **Given that** $\sqrt{3}$ **is an irrational number, show that** $(5 + 2\sqrt{3})$ **is an irrational number.**

Sol. Let $(5 + 2\sqrt{3}) = x$, where x is a rational number. $\dfrac{1}{2}$

$\Rightarrow \sqrt{3} = \dfrac{x - 5}{2}$ 1

L.H.S. is an irrational and R.H.S. is a rational number. 1

It is a contradiction

$\therefore$ Our assumption is wrong

$\therefore$ $5 + 2\sqrt{3}$ is a irrational number. $\dfrac{1}{2}$

OR

An army contingent of 612 members is to march behind an army band of 48 members in a parade. The two groups are to march in the same number of columns. What is the maximum number of columns in which they can march?

$612 = 2^2 \times 3^2 \times 17$ 1

$48 = 2^4 \times 3$ 1

HCF (612, 48) $= 2^2 \times 3$

$= 12$ $\dfrac{1}{2}$

Number of column $= 12$ $\dfrac{1}{2}$

32. **Prove that, in a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.**

Sol. Correct figure, given, To prove and construction. $1\frac{1}{2}$

Correct Proof $1\frac{1}{2}$

Read the following passage carefully and then answer the questions given at the end.

33. **To conduct Sports Day activities, in your rectangular shaped school ground ABCD, lines have been drawn with chalk powder at a distance of 1 m each. 100 flower pots have been placed at a distance of 1 m from each other along AD, as shown in Fig. 5. Niharika runs $\frac{1}{4}$th the distance AD on the 2nd line and posts a green flag. Preet runs $\frac{1}{5}$th the distance AD on the eighth line and posts a red flag.**
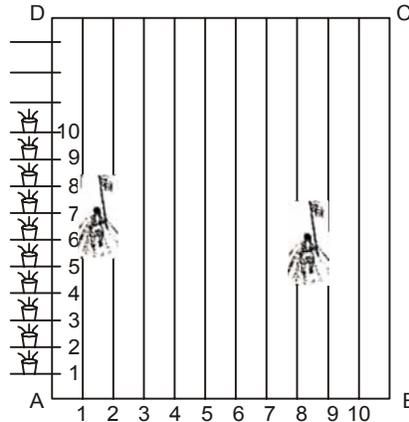
Fig. 5

(i) What is the distance between the two flags?

(ii) If Rashmi has to post a blue flag exactly half way between the line segment joining the two flags, where should she post the blue flag?

Sol. Coordinate of green flag = (2, 25) $\frac{1}{2}$

Coordinate of Red flag = (8, 20) $\frac{1}{2}$

(i) Distance between the flags = $\sqrt{(-6)^2 + (5)^2}$

$= \sqrt{61}$ units $\qquad$ 1

(ii) Mid point between = (5, 22.5)   1

green and Red flag

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34. **Solve graphically: 2x + 3y = 2, x – 2y = 8**

Sol. Correct graph of $2x + 3y = 2$ 1

Correct graph of $x – 2y = 8$ 1

Point of intersection = (4, –2)

or   x = 4, y = – 2   1

SECTION D

Q. Nos. 35 to 40 carry 4 marks each.

35. **A two digit number is such that the product of its digits is 14. If 45 is added to the number; the digits interchange their places. Find the number.**

Sol. Let unit digit = x

Tens digit = y

∴ Number = $10y + x$ $\frac{1}{2}$

$10y + x + 45 = 10x + y$ 1

$\Rightarrow$ $x – y = 5$ ...(i) $\frac{1}{2}$

and $xy = 14$ ...(ii) $\frac{1}{2}$

Solving (i) and (ii)

    x = 7, y = 2   1

∴   Number = 27 $\frac{1}{2}$

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36. **If 4 times the 4th term of an AP is equal to 18 times the 18th term, then find the 22nd term.**

Sol. Let first term be a and common difference = d

∴ $4(a + 3d) = 18(a + 17d)$ 1

$\Rightarrow$ $a = –21d$ 1

22nd term = $a + 21d$ 1

        = $–21d + 21d$

        = 0   1

OR

How many terms of the AP : 24, 21, 18, ... must be taken so that their sum is 78?

Let the number of terms be n,   d = –3 $\frac{1}{2}$

$\therefore \frac{n}{2}\left[48+(n-1)(-3)\right]=78$ 1
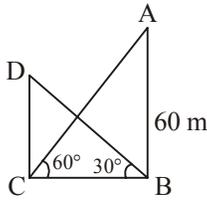
$\Rightarrow n^2 - 17n + 52 = 0$ 1

$(n - 13)(n - 4) = 0$ 1

$\Rightarrow n = 13$ or 4

$\therefore$ Number of terms = 4 or 13 $\frac{1}{2}$

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37. **The angle of elevation of the top of a building from the foot of a tower is 30°. The angle of elevation of the top of the tower from the foot of the building is 60°. If the tower is 60 m high, find the height of the building.**

Sol.

$\frac{AB}{BC} = \tan 60°$ Correct figure   1

$\frac{60}{BC} = \sqrt{3}$

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

Again, $\frac{DC}{CB} = \tan 30°$ 1

$\frac{DC}{20\sqrt{3}} = \frac{1}{\sqrt{3}}$

$\Rightarrow DC = 20$ m

Height of building = 20 m   1

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38. **In Fig. 6, DEFG is a square in a triangle ABC right angled at A.**

Prove that

(i) ΔAGF ~ ΔDBG

(ii) ΔAGF ~ ΔEFC
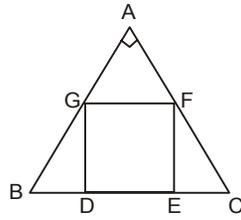
Fig.6

Sol.
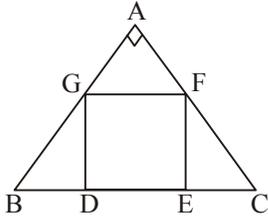
GF || DE (DEFG is square)

∴ ∠AGF = ∠ABC (Corresponding angles) $\dfrac{1}{2}$

∴ ∠A = ∠GDB = 90°

∴ ΔAGF ∼ ΔDBG (By AA similarity) $1\dfrac{1}{2}$

Again DEFG being a square ∠AFG = ∠ACB (corresponding angles) $\dfrac{1}{2}$

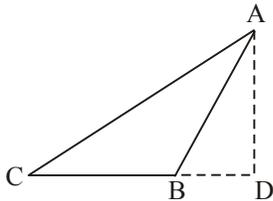∴ ∠A = ∠CEF   (each 90°)

ΔAGF ∼ ΔEFC (By AA similarity) $1\dfrac{1}{2}$

OR

In an obtuse ΔABC (∠B is obtuse), AD is perpendicular to CB produced. Then prove that
$AC^2 = AB^2 + BC^2 + 2BC \times BD$.

Sol.   In rt ΔADC   Correct figure   1
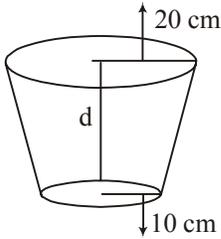

$AC^2 = AD^2 + CD^2$ $\dfrac{1}{2}$

$= AD^2 + (CB + BD)^2$ 1

$= AD^2 + BD^2 + CB^2 + 2CB.BD$ 1

$= AB^2 + CB^2 + 2CB . BD$ ∵ Δ ABD is rt angled $\dfrac{1}{2}$

39. **An open metal bucket is in the shape of a frustum of cone of height 21 cm with radii of its lower and upper ends are 10 cm and 20 cm respectively. Find the cost of milk which can completely fill the bucket at the rate of ₹ 40 per litre.**

Sol.

Volume of Bucket $= \dfrac{\pi}{3}[400 + 100 + 200] \times 21$

$= 4900 \times \dfrac{22}{7} = 15400 \text{ cm}^3$ 2

Volume of milk $= \dfrac{15400}{1000} = 15.4$ litres   1

Cost of milk $= ₹\ 15.4 \times 40 = ₹\ 616$ 1

<div align="center">

OR

</div>

A solid is in the shape of a cone surmounted on a hemisphere. The radius of each of them being 3.5 cm and the total height of the solid is 9.5 cm. Find the volume of the solid.

Volume of hemisphere $= \dfrac{2}{3}\pi r^3$

$= \dfrac{2}{3} \times \dfrac{22}{7} \times \left(\dfrac{7}{2}\right)^3$

$= \dfrac{539}{6} \text{ cm}^3$ $1\frac{1}{2}$

Height of cone $= (9.5 - 3.5) \text{ cm} = 6 \text{ cm}$ $\frac{1}{2}$

Volume of cone $= \dfrac{1}{3}\pi r^2 h$

$= \dfrac{1}{3} \times \dfrac{\overset{11}{\cancel{22}}}{\cancel{7}} \times \dfrac{\cancel{7}}{\cancel{2}} \times \dfrac{7}{2} \times 6 = 77 \text{ cm}^3$ 1

Total volume of solid

$= \dfrac{539}{6} + \dfrac{77}{1}$

$= \dfrac{539 + 462}{6} = \dfrac{1001}{6} \text{ cm}^3 \text{ or } 166.83 \text{ cm}^3$ 1

40. **Find the mean of the following data:**

Classes	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100	100 – 120
Frequency	20	35	52	44	38	31

Sol.

x	f	fx
10	20	200
30	35	1050
50	52	2600
70	44	3080
90	38	3420
110	31	3410
	220	13760

Correct Table   2

$$\therefore \quad \text{Mean} = \frac{\Sigma fx}{\Sigma f} = \frac{13760}{220} \quad \text{or} \quad 62.54$$

2