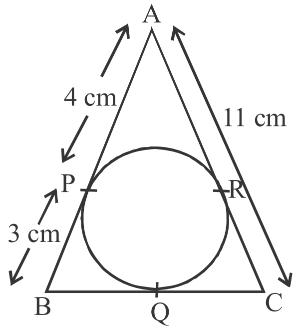
QUESTION PAPER CODE 30/1/2

EXPECTED ANSWER/VALUE POINTS

SECTION – A

Q. NO. 1 to 10 are multiple choice type question of 1 mark each. Select the correct option.

Q.No.		Marks
1.	The HCF and the LCM of 12, 21, 15 respectively are **(a)** 3,140 **(b)** 12,420 **(c)** 3,420 **(d)** 420,3 **Ans:** (c) 3,420	1
2.	The value of x for which 2x,(x + 10) and (3x + 2) are the three consecutive terms of an AP, is **(a)** 6 **(b)** –6 **(c)** 18 **(d)** –18 **Ans:** (a) 6	1
3.	The value of k for which the system of equations $x + y - 4 = 0$ and $2x + ky = 3$ has no solution, is **(a)** –2 **(b)** $\neq 2$ **(c)** 3 **(d)** 2 **Ans:** (d) 2	1
4.	The first term of an AP is p and the common difference is q, then its 10^{th} term is **(a)** $q + 9p$ **(b)** $p - 9q$ **(c)** $p + 9q$ **(d)** $2p + 9q$ **Ans:** (c) $p + 9q$	1
5.	The quadratic polynomial, the sum of whose zeroes is –5 and their product is 6, is **(a)** $x^2 + 5x + 6$ **(b)** $x^2 - 5x + 6$ **(c)** $x^2 - 5x - 6$ **(d)** $-x^2 + 5x + 6$ **Ans:** (a) $x^2 + 5x + 6$	1
6.	The distance between the points $(a \cos \theta + b \sin \theta, 0)$ and $(0, a \sin \theta - b \cos \theta)$, is **(a)** $a^2 + b^2$ **(b)** $a^2 - b^2$ **(c)** $\sqrt{a^2+b^2}$ **(d)** $\sqrt{a^2-b^2}$ **Ans:** (c) $\sqrt{a^2+b^2}$	1
7.	The total number of factors of a prime number is **(a)** 1 **(b)** 0 **(c)** 2 **(d)** 3 **Ans:** (c) 2	1
8.	If the point P(k, 0) divides the line segment joining the points A(2, –2) and B(–7, 4) in the ratio 1 : 2, then the value of k is, **(a)** 1 **(b)** 2 **(c)** –2 **(d)** –1 **Ans:** (d) –1	1
9.	The value of p, for which the points A(3, 1), B(5, p) and C(7, –5) are collinear, is **(a)** –2 **(b)** 2 **(c)** –1 **(d)** 1 **Ans:** (a) –2	1
10.	If one of the zeroes of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is **(a)** 10 **(b)** –10 **(c)** –7 **(d)** –2 **Ans:** (b) –10	1

	In Q. Nos. 11 to 15, fill in the blanks. Each question is of 1 mark.	
11.	ABC is an equilateral triangle of side 2a, then length of one of its altitude is _______.	
	Ans: $\sqrt{3}$ a	1
12.	In Fig. 1, ΔABC is circumscribing a circle, the length of BC is _______cm.  Fig. 1	
	Ans: 10	1
13.	The value of $\left(\sin^2\theta + \dfrac{1}{1+\tan^2\theta}\right) =$ _________.	
	Ans: 1	1
	OR	
	The value of $(1 + \tan^2\theta)\ (1 - \sin\theta)\ (1 + \sin\theta) =$_______.	
	Ans: 1	1
14.	$\left(\dfrac{\sin 35^\circ}{\cos 55^\circ}\right)^2 + \left(\dfrac{\cos 43^\circ}{\sin 47^\circ}\right)^2 - 2\cos 60^\circ =$ _____________.	
	Ans: 1	1
15.	ABC and BDE are two equilateral triangles such that D is the mid-point of BC. Ratio of the areas of triangles ABC and BDE is _____________.	
	Ans: 4 : 1	1
	Q. Nos. 16 to 20 are short answer type questions of 1 mark each.	
16.	A die is thrown once. What is the probability of getting a number less than 3?	
	Ans: P (number less than 3) = $\dfrac{2}{6}$ or $\dfrac{1}{3}$	1
	OR	
	If the probability of winning a game is 0.07, what is the probability of losing it?	
	Ans: P (losing) = 1 – 0.07	1/2
	= 0.93	1/2
17.	If the mean of first n natural number is 15, then find n.	
	Ans: $\dfrac{\frac{n(n+1)}{2}}{n} = 15$	1/2
	$\therefore$ n = 29	1/2

18. Two cones have their heights in the ratio 1:3 and radii in the ratio 3:1. What is the ratio of their volumes?

Ans: $\frac{r_1}{r_2} = \frac{3}{1}, \frac{h_1}{h_2} = \frac{1}{3}$ **1/2**

$\therefore$ Ratio of volumes $= \dfrac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2} = 3:1$ **1/2**

19. The ratio of the length of a vertical rod and the length of its shadow is $1:\sqrt{3}$. Find the angle of elevation of the sun at that moment?

Ans: $\tan\theta = \frac{1}{\sqrt{3}} \Rightarrow \theta = 30°$ **1/2+1/2**

20. A die is thrown once. What is the probabiliy of getting an even prime number?

Ans: Number of even prime numbers on a die is 1 (i.e. 2) **1/2**

$\therefore$ P (even prime number) = $\frac{1}{6}$ **1/2**

SECTION – B

Q. Nos. 21 to 26 carry 2 marks each.

21. In Fig. 2 DE || AC and DC || AP. Prove that $\frac{BE}{EC} = \frac{BC}{CP}$.

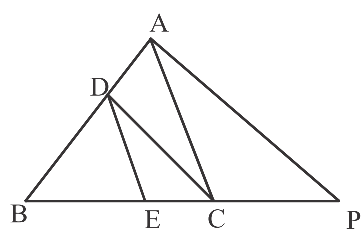


Fig 2

Ans: In ΔABC, DE || AC, $\therefore \frac{BD}{DA} = \frac{BE}{EC}$ ... (i) **1**

In ΔABP, DC || AP, $\therefore \frac{BD}{DA} = \frac{BC}{CP}$ ... (ii) **1/2**

From (i) & (ii), $\frac{BE}{EC} = \frac{BC}{CP}$ **1/2**

OR

In Fig. 3, two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that $\angle PTQ = 2\angle OPQ$.

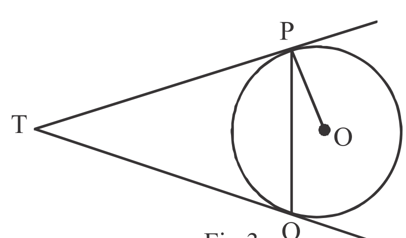


Fig 3

Ans: Let $\angle OPQ = \theta$

$\therefore \angle TPQ = \angle TQP = 90° - \theta$ **1/2**

In ΔTPQ, $2(90° - \theta) + \angle PTQ = 180°$ **1**

$\therefore \angle PTQ = 2\theta$ **1/2**

$= 2\angle OPQ$

22. The rod AC of a TV disc antenna is fixed at right angle to the wall AB and a rod CD is supporting the disc as shown in Fig. 4. If AC = 1.5m long and CD = 3m, find (i) $\tan\theta$ (ii) $\sec\theta + \text{cosec}\theta$.

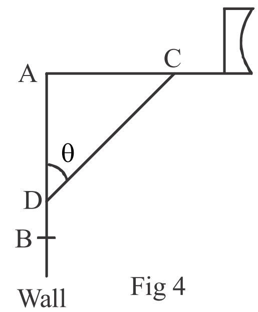


Fig 4

Ans: $\frac{AC}{CD} = \sin\theta \Rightarrow \sin\theta = \frac{1}{2} \Rightarrow \theta = 30°$ **1/2**

(i) $\tan\theta = \tan 30° = \frac{1}{\sqrt{3}}$ **1/2**

(ii) $\sec\theta + \text{cosec}\theta = \sec 30° + \text{cosec} 30°$ **1**

$= \frac{2}{\sqrt{3}} + 2$ or $\frac{2(3+\sqrt{3})}{3}$

23. If a number x is chosen at random from the numbers –3, –2, –1, 0, 1, 2, 3. What is the probability that $x^2 \le 4$?

Ans: Total number of outcomes = 7

Favourable outcomes are –2, –1, 0, 1, 2, i.e., 5 **1**

$\therefore \quad P(x^2 \le 4) = \frac{5}{7}$ **1**

24. Find the mean of the following distribution:

Class:	3-5	5-7	7-9	9-11	11-13
Frequency:	5	10	10	7	8

Ans: **1½**

Classes	x_i	f_i	$f_x x_i$
3 – 5	4	5	20
5 – 7	6	10	60
7 – 9	8	10	80
9 – 11	10	7	70
11 – 13	12	8	96
Total		40	326

$\bar{x} = \frac{\sum f_i x_i}{\sum f_i} = \frac{326}{40} = 8.15$ **1/2**

OR

Find the mode of the following data:

Class:	0-20	20-40	40-60	60-80	80-100	110-120	120-140
Frequency:	6	8	10	12	6	5	3

Ans: Modal class : 60 – 80 — 1/2

Mode = $\ell + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h = 60 + \frac{12-10}{24-10-6} \times 20$ — 1

= 60 + 5 = 65 — 1/2

25. Find the sum of first 20 terms of the following AP:
1, 4, 7, 10, …

Ans: $S_{20} = \frac{20}{2}[2 \times 1 + 19 \times 3]$ — $1\frac{1}{2}$

= 10 × 59 = 590 — 1/2

26. The perimeter of a sector of a circle of radius 5.2 cm is 16.4 cm. Find the area of the sector.

Ans: $2 \times 5.2 + \frac{2\pi(5.2)\theta}{360°} = 16.4 \Rightarrow \theta = \frac{360 \times 6}{2\pi \times 5.2}$ — 1

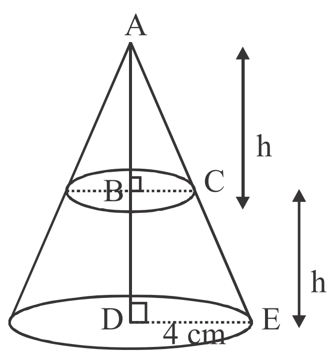
Area of sector = $\frac{\pi \times (5.2)^2}{360°} \times \frac{360 \times 6}{2\pi \times 5.2} = 15.6 \text{ cm}^2$ — 1

SECTION – C

Question numbers 27 to 34 carry 3 marks each.

27. A cone of base radius 4 cm is divided into two parts by drawing a plane through the mid-point of its height and parallel to its base. Compare the volume of the two parts.

Ans: — cor. fig 1/2



$\Delta ABC \sim \Delta ADE, \frac{h}{2h} = \frac{BC}{4}$

$\therefore$ BC = 2 cm — 1

Ratio of volumes of two parts

$= \frac{\frac{1}{3}\pi \times 2^2 \times h}{\frac{1}{3}\pi \times (2^2 + 4^2 + 2 \times 4) \times h}$ — 1

$= \frac{4}{28} = \frac{1}{7}$ or 1 : 7 (accept 7 : 1 also) — 1/2

28. In a triangle, if square of one side is equal to the sum of the squares of the other two sides, then prove that the angle opposite to the first side is a right angle.

Ans: For correct given, To prove, construction and figure. $1\frac{1}{2}$

For correct proof. $1\frac{1}{2}$

29. Find the area of triangle PQR formed by the points P(–5, 7), Q(–4, –5) and R(4, 5).

Ans: $\text{ar}(PQR) = \frac{1}{2}\left[-5(-5-5)-4(5-7)+4(7+5)\right]$ sq. units **2**

$= \frac{1}{2}[50+8+48]$ sq. units

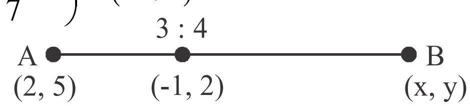
= 53 sq. units **1**

OR

If the point C(–1, 2) divides internally the line segment joining A(2, 5) and B(x, y) in the ratio 3 : 4, find the coordinates of B.

Ans: Coordinates of C arc $\left(\frac{3x+8}{7}, \frac{3y+20}{7}\right) = (-1, 2)$ $1\frac{1}{2}$

$\Rightarrow x = -5,\ y = -2$ **1**



$\therefore$ Coordinates of B are (–5, –2) **1/2**

30. Find the quadratic polynomial whose zeroes are reciprocal of the zeroes of the polynomial $f(x) = ax^2 + bx + c$, $a \neq 0$, $c \neq 0$.

Ans: $f(x) = ax^2 + bx + c$

$\alpha + \beta = -\frac{b}{a},\ \alpha\beta = \frac{c}{a}$ **1/2**

New sum of zeroes $= \frac{1}{\alpha} + \frac{1}{\beta} = -\frac{b}{c}$ **1**

New product of zeroes $= \frac{1}{\alpha} \times \frac{1}{\beta} = \frac{a}{c}$ **1**

$\therefore$ Required quardratic polynomial $= x^2 + \frac{b}{c}x + \frac{a}{c}$ or $(cx^2 + bx + a)$ **1/2**

OR

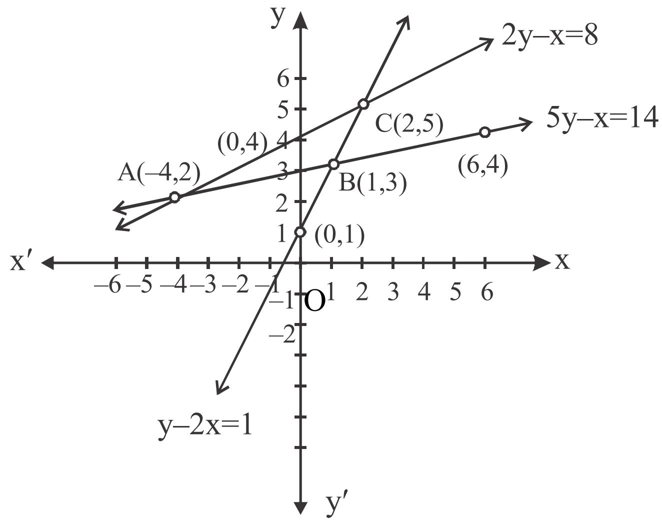
Divide the polynomial $f(x) = 3x^2 - x^3 - 3x + 5$ by the polynomial $g(x) = x - 1 - x^2$ and verify the division algorithm.

Ans: **2**

$$
\begin{array}{r|l}
-x^2 + x - 1 & -x^3 + 3x^2 - 3x + 5 \quad (\, x - 2 \\
 & -x^3 + x^2 - x \\
 & +\quad -\quad + \\
\hline
 & 2x^2 - 2x + 5 \\
 & 2x^2 - 2x + 2 \\
 & -\quad +\quad - \\
\hline
 & 3 \\
\hline
\end{array}
$$

	Divisor × Quotient + Remainder $= (-x^2 + x - 1)(x - 2) + 3$ $= -x^3 + 3x^2 - 3x + 5 = \text{Dividend}$		1
31.	Determine graphically the coordinates of the vertices of a triangle, the equations of whose sides are given by $2y - x = 8$, $5y - x = 14$ and $y - 2x = 1$.		

Ans:



$2y - x = 8$

x	0	2	–4
y	4	5	2

$5y - x = 14$

x	1	6	–4
y	3	4	2

$y - 2x = 1$

x	1	2	0
y	3	5	1

Drawing 3 lines — $1\frac{1}{2}$

Coordinates of the vertices of the triangle are A(–4, 2),

B(1, 3) and C(2, 5) — $1\frac{1}{2}$

OR

If 4 is the zero of the cubic polynomial $x^3 - 3x^2 - 10x + 24$, find its other two zeroes.

Ans: $x - 4$ is a factor of given polynomial.

$$
\begin{array}{r|l}
x - 4 & x^3 - 3x^2 - 10x + 24 \ (x^2 + x - 6 \\
 & x^3 - 4x^2 \\
 & \underline{- \quad +} \\
 & x^2 - 10x + 24 \\
 & x^2 - 4x \\
 & \underline{- \quad +} \\
 & -6x + 24 \\
 & -6x + 24 \\
 & \underline{+ \quad -} \\
 & 0
\end{array}
$$

2

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

∴ Other than zeroes are –3 and 2. — 1

32. A train covers a distance of 480 km at a uniform speed. If the speed had been 8 km/h less, then it would have taken 3 hours more to cover the same distance. Find the original speed of the train.

Ans: Let the speed of train be x km/hr

$\therefore \dfrac{480}{x-8} - \dfrac{480}{x} = 3$ **1**

$\Rightarrow \quad x^2 - 8x - 1280 = 0$ **1**

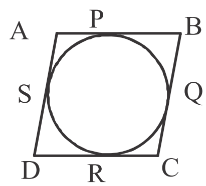
$(x - 40)(x + 32) = 0$

$x = 40, -32$ (Rejected) **1**

$\therefore$ Speed of train = 40 km/hr

33. Prove that the parallelogram circumscribing a circle is a rhombus.

Ans: $\left.\begin{array}{l} AP = AS \\ BP = BQ \\ DR = DS \\ CR = CQ \end{array}\right\}$ **1**



Adding, we get (AP + BP) + (DR + CR) + (AS + DS) + (BQ + CQ)

$\Rightarrow$ AB + CD = BC + AD **1**

Since ABCD is a ||gm $\therefore$ 2AB = 2 BC

$\Rightarrow$ AB = BC **1**

34. Prove that : $2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta) + 1 = 0$

Ans: $2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta) + 1$

$= 2\left[\left(\sin^2\theta\right)^3 + \left(\cos^2\theta\right)^3\right] - 3\left(\sin^4\theta + \cos^4\theta\right) + 1$ **1**

$= 2\left[\left(\sin^2\theta + \cos^2\theta\right)\left(\sin^4\theta + \cos^4\theta - \sin^2\theta\cos^2\theta\right)\right] - 3\left(\sin^4\theta + \cos^4\theta\right) + 1$ **1**

$= -\left(\sin^4\theta + \cos^4\theta\right) - 2\sin^2\theta\cos^2\theta + 1$

$\left.\begin{array}{l} = -\left[\left(\sin^2\theta + \cos^2\theta\right)^2 - 2\sin^2\theta\cos^2\theta\right] - 2\sin^2\theta\cos^2\theta + 1 \\ = -1 + 1 = 0 \end{array}\right\}$ **1**

SECTION – D

Question numbers 35 to 40 carry 4 marks each.

35. The following table gives production yield per hectare (in quintals) of wheat of 100 farms of a village:

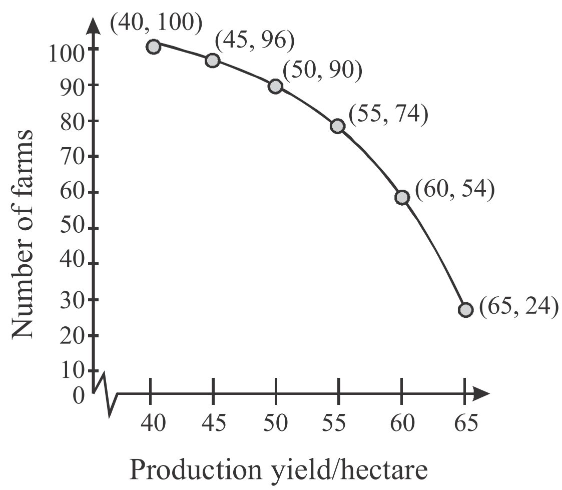
Production yield/hect.	40-45	45-50	50-55	55-60	60-65	65-70
No. of farms	4	6	16	20	30	24

Change the distribution to 'a more than' type distribution and draw its ogive.

Ans:

Production yield/hectare	No. of forms
More than or equal to 40	100
More than or equal to 45	96
More than or equal to 50	90
More than or equal to 55	74
More than or equal to 60	54
More than or equal to 65	24
Total	

2



2

OR

The median of the following data is 525. Find the values of x and y, if total frequency is 100:

Class :	0-100	100-200	200-300	300-400	400-500	500-600	600-700	700-800	800-900	900-1000
Frequency:	2	5	x	12	17	20	y	9	7	4

Ans:

Classes	Frequency	Cumulative frequency
0-100	2	2
100-200	5	7
200-300	x	7 + x
300-400	12	19 + x
400-500	17	36 + x
500-600	20	56 + x
600-700	y	56 + x + y
700-800	9	65 + x+ y
800-900	7	72 + x+ y
900-1000	4	76 + x+ y
Total	100	

→ Median class (500-600) 2

$76 + x + y = 100 \Rightarrow x + y = 24$ ... (i) **1/2**

500 – 600 is the median class

$$\text{Median} = \ell + \frac{\frac{n}{2} - cf}{f} \times h$$

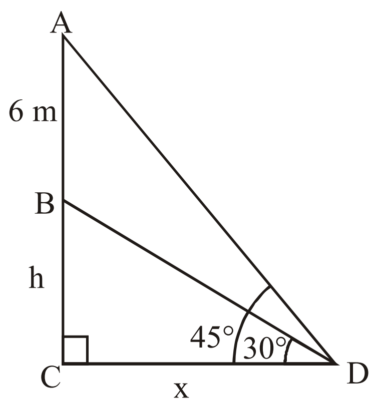
$$\Rightarrow 525 = 500 + \frac{50 - 36 - x}{20} \times 100$$

Solving we get, x = 9 **1**

From (i), y = 15 **1/2**

36. A vertical tower stands on a horizontal plane and is surmounted by a vertical flag-staff of height 6 m. At a point on the plane, the angle of elevation of the bottom and top of the flag-staff are 30° and 45° respectively. Find the height of the tower. (Take $\sqrt{3}$ = 1.73)

Ans: **cor. fig 1**



$\frac{h}{x} = \tan 30°$ **1**

$\Rightarrow x = h\sqrt{3}$

$\frac{6+h}{x} = \tan 45° \Rightarrow 6 + h = x$ **1**

$\therefore h = \frac{6}{\sqrt{3}-1} = 3(\sqrt{3}+1) = 3 \times 2.73$ m

= 8.19 m **1**

37. Show that the square of any positive integer cannot be of form (5q + 2) or (5q +3) for any integer q.

Ans: Let a be any positive integer. Take b = 5 as the divisor.

$\therefore$ a = 5m + r , r = 0, 1, 2, 3, 4 **1**

Case-1 : $a = 5m \Rightarrow a^2 = 25m^2 = 5(5m^2) = 5q$

Case-2 : $a = 5m+1 \Rightarrow a^2 = 5(5m^2 + 2m) + 1 = 5q + 1$

Case-3 : $a = 5m+2 \Rightarrow a^2 = 5(5m^2 + 4m) + 4 = 5q + 4$

Case-4 : $a = 5m+3 \Rightarrow a^2 = 5(5m^2 + 6m + 1) + 4 = 5q + 4$

Case-5 : $a = 5m+4 \Rightarrow a^2 = 5(5m^2 + 8m + 3) + 1 = 5q + 1$

1/2 for each case $= 2\frac{1}{2}$

Hence square of any positive integer cannot be of the form (5q + 2) or (5q + 3) for any integer q. **1/2**

	OR	
	Prove that one of every three consecutive positive integers is divisible by 3.	
	Ans: Let n be any positive integer. Divide it by 3.	
	$\therefore$ n = 3q + r, r = 0, 1, 2	1
	Case-1 : n = 3q (divisible by 3)	
	n + 1 = 3q + 1, n + 2 = 3q + 2	1 for
	Case-2 : n = 3q+1 $\Rightarrow$ n+1 = 3q + 2, n+2 = 3q+3 (divisible by 3)	each
	Case-3 : n = 3q+2 $\Rightarrow$ n+1 = 3q + 3 (divisible by 3), n + 2 = 3q + 4	case = 3
38.	The sum of four consecutive numbers in AP is 32 and the ratio of product of the first and last terms to the product of two middle terms is 7:15. Find the numbers.	
	Ans: Let four consecutive number be a – 3d, a – d, a + d, a + 3d	1/2
	Sum = 32 $\therefore$ 4a = 32 $\Rightarrow$ a = 8	1/2
	$\frac{(a-3d)(a+3d)}{(a-d)(a+d)} = \frac{7}{15} \Rightarrow 15(64-9d^2) = 7(64-d^2)$	1
	$\therefore d^2 = 4 \Rightarrow d = \pm 2$	1
	Four numbers are 2, 6, 10, 14.	1
	OR	
	Solve: 1+ 4 + 7 + 10 +…+ x = 287	
	Ans: $x = a_n = 1 + 3n - 3 = 3n - 2$	1
	$S_n = 287 \Rightarrow \frac{n}{2}[1 + 3n - 2] = 287$	1
	$\therefore 3n^2 - n - 574 = 0$	1/2
	$(n-14)(3n+41) = 0 \Rightarrow n = 14$	1
	$\therefore$ x = 3n – 2 = 40	1/2
39.	A bucket in the form of a frustum of a cone of height 16 cm with radii of its lower and upper circular ends as 8 cm and 20 cm respectively. Find cost of milk which can completely fill the bucket, at the rate of ₹ 40 per litre. (Use $\pi = 3.14$)	
	Ans: Capacity of bucket = $\frac{1}{3}\pi h\left(r_1^2 + r_2^2 + r_1 r_2\right)$	1
	$= \frac{1}{3} \times 3.14 \times 16\left(8^2 + 20^2 + 8 \times 20\right) cm^3$	$1\frac{1}{2}$
	= 10449.92 cm^3	
	= 10.45 *l* (approx.)	1/2
	Cost of milk = ₹ 40 × 10.45 = ₹ 418	1

40.	Construct a triangle with sides 4 cm, 5 cm and 6 cm. Then construct another triangle whose sides are $\frac{2}{3}$ times the corresponding sides of the first triangle.	
	Ans: Construction of ΔABC with given dimensions	**1**
	Construction of similar triangle	**3**