CBSE Class 10 Maths Question Paper Solution 2020
Set 430/3/1

QUESTION PAPER CODE 430/3/1
EXPECTED ANSWER/VALUE POINTS
SECTION A

Question numbers 1 to 10 are multiple choice questions of 1 mark each.

Select the correct choice.

1. What is the largest number that divides 245 and 1029, leaving remainder 5 in each?

(a) 15 (b) 16 (c) 9 (d) 5

Sol. (b) 16 1

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2. Consider the following distribution:

Classes:	**0 – 5**	**5 – 10**	**10 – 15**	**15 – 20**	**20 – 25**
Frequency:	**10**	**15**	**12**	**20**	**9**

The sum of lower limits of the median class and the modal class is

(a) 15 (b) 25 (c) 30 (d) 35

Sol. (b) 25 1

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3. If the two tangents inclined at an angle of 60° are drawn to a circle of radius 3 cm, then the length of each tangent is:

(a) 3 cm (b) $\frac{3\sqrt{3}}{2}$ cm (c) $3\sqrt{3}$ cm (d) 6 cm

Sol. (c) $3\sqrt{3}$ cm 1

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4. The simplest form of $\frac{1095}{1168}$ is

(a) $\frac{17}{26}$ (b) $\frac{25}{26}$ (c) $\frac{13}{16}$ (d) $\frac{15}{16}$

Sol. (d) $\frac{15}{16}$ 1

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5. One card is drawn at random from a well – shuffled deck of 52 cards. What is the probability of getting a Jack?

(a) $\frac{3}{26}$ (b) $\frac{1}{52}$ (c) $\frac{1}{13}$ (d) $\frac{3}{52}$

Sol. (c) $\frac{1}{13}$ 1

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6. **If one zero of the quadratic polynomial, (k – 1) x^2 + kx + 1 is –4 then the value of k is**

(a) $-\frac{5}{4}$ **(b)** $\frac{5}{4}$ **(c)** $-\frac{4}{3}$ **(d)** $\frac{4}{3}$

Sol. (b) $\frac{5}{4}$ 1

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7. **Which of the following rational numbers is expressible as a terminating decimal?**

(a) $\frac{124}{165}$ **(b)** $\frac{131}{30}$ **(c)** $\frac{2027}{625}$ **(d)** $\frac{1625}{462}$

Sol. (c) $\frac{2027}{625}$ 1

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8. **If α and β are the zeros of ($2x^2$ + 5x – 9), then the value of $\alpha\beta$ is**

(a) $-\frac{5}{2}$ **(b)** $\frac{5}{2}$ **(c)** $-\frac{9}{2}$ **(d)** $\frac{9}{2}$

Sol. (c) $\frac{-9}{2}$ 1

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9. **The perimeter of a triangle with vertices (0, 4), (0, 0) and (3, 0) is**

(a) $7+\sqrt{5}$ **(b) 5** **(c) 10** **(d) 12**

Sol. (d) 12 1

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10. **If P(–1, 1) is the midpoint of the line segment joining A(–3, b) and B(1, b + 4), then b is equal to**

(a) 1 **(b) –1** **(c) 2** **(d) 0**

Sol. (b) –1 1

In Question numbers 11 to 15, fill in the blanks:

11. **Distance between (a, –b) and (a, b) is ________.**

Sol. 2b units 1

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12. **The value of k for which system of equations x + 2y = 3 and 5x + ky = 7 has no solution is ________.**

Sol. k = 10 1

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13. **The value of ($\cos^2 45°$ + $\cot^2 45°$) is ________.**

Sol. $\frac{3}{2}$ 1

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14. **The value of (tan 27° – cot 63°) is ________.**

Sol. 0 $\quad$ 1

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15. **If ratio of the corresponding sides of two similar triangles is 2:3, then ratio of their perimeters is _________.**

Sol. 2 : 3 $\quad$ 1

Answer the following questions, Question numbers 16 to 20.

16. **If $\sec\theta = \dfrac{25}{7}$, then find the value of $\cot\theta$.**

Sol. $\tan\theta = \dfrac{24}{7} \Rightarrow \cot\theta = \dfrac{7}{24}$ $\quad \frac{1}{2}+\frac{1}{2}$

OR

If $3\tan\theta = 4$, then find the value of $\left(\dfrac{3\sin\theta + 2\cos\theta}{3\sin\theta - 2\cos\theta}\right)$

Sol. Given expression $= \dfrac{3\times\frac{4}{3}+2}{3\times\frac{4}{3}-2} = 3$ $\quad \frac{1}{2}+\frac{1}{2}$

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17. **The perimeter of a sector of a circle of radius 14 cm is 68 cm. Find the area of the sector.**

Sol. $l = 68 - 28 = 40$ cm $\quad \frac{1}{2}$

$A = 280 \text{ cm}^2$ $\quad \frac{1}{2}$

OR

The circumference of a circle is 39.6 cm. Find its area.

Sol. $r = \dfrac{39.6}{2\pi}$ $\quad \frac{1}{2}$

$A = \dfrac{392.04}{\pi} \text{ or } 124.74 \text{ cm}^2$ $\quad \frac{1}{2}$

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18. **A letter of English alphabet is chosen at random. Determine the probability that chosen letter is a consonant.**

Sol. No. of consonents = 21 $\quad \frac{1}{2}$

$\therefore\ P = \dfrac{21}{26}$ $\quad \frac{1}{2}$

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19. In Fig. 1, D and E are points on sides AB and AC respectively of a ΔABC such that DE || BC.

If AD = 3.6 cm, AB = 10 cm and AE =4.5 cm, find EC and AC.

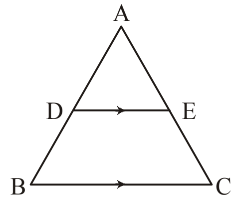

Fig. 1

Sol. EC = 8 cm $\frac{1}{2}$

AC = 12.5 cm $\frac{1}{2}$

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20. If 3y – 1, 3y + 5 and 5y + 1 are three consecutive terms of an A.P., then find the value of y.

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

$y = 5$ $\frac{1}{2}$

SECTION B

Question numbers 21 to 26 carry 2 marks each.

21. A bag contains 5 red, 8 white and 7 black balls. A ball is drawn at random from the bag. Find the probability that the drawn ball is

(i) red or white

(ii) not a white ball

Sol. Total no. of balls = 20

(i) P(ball is red or white) = $\frac{13}{20}$ 1

(ii) P(Not a white ball) = $\frac{12}{20}$ or $\frac{3}{5}$ 1

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22. Two dice are thrown at the same time. Find the probability of getting different numbers on the two dice.

Sol. Total number of outcomes = 36 $\frac{1}{2}$

Favourable numbers of outcomes = 30 $\frac{1}{2}$

Probability = $\frac{30}{36}$ or $\frac{5}{6}$ 1

$\left(\begin{array}{c}\text{Both numbers} \\ \text{are different}\end{array}\right)$

OR

Two dice are thrown at the same time. Find the probability that the sum of the two numbers appearing on the top of the dice is more than 9.

Sol. Favourable outcomes (5, 5), (4, 6), (6, 4), (6, 5), (5, 6), (6, 6)

Total number of outcomes = 36 $\frac{1}{2}$

Number of favourable outcomes = 6 $\frac{1}{2}$

Required probability = $\frac{6}{36}$ or $\frac{1}{6}$ 1

23. In Fig. 2, 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 and CQ = 5 cm then find the length of BC.

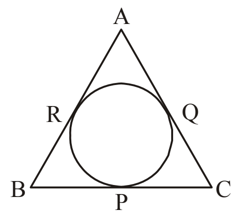

Fig. 2

Sol. AQ = AR = 7 cm $\frac{1}{2}$

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

BC = BP + PC

= BR + CQ $\frac{1}{2}$

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

24. Prove that: $\sqrt{\sec^2\theta + \operatorname{cosec}^2\theta} = \tan\theta + \cot\theta$

Sol. LHS = $\sqrt{\sec^2\theta + \operatorname{cosec}^2\theta} = \sqrt{1 + \tan^2\theta + 1 + \cot^2\theta}$ 1

$= \sqrt{\tan^2\theta + \cot^2\theta + 2}$

$= \sqrt{\tan^2\theta + \cot^2\theta + 2\tan\theta\cot\theta}$

$= \sqrt{(\tan\theta + \cot\theta)^2}$ $\frac{1}{2}$

$= \tan\theta + \cot\theta = \text{RHS}$ $\frac{1}{2}$

OR

Prove that: $\dfrac{\sin\theta}{1-\cos\theta} = (\operatorname{cosec}\theta + \cot\theta)$

Sol. LHS $= \dfrac{\sin\theta}{1-\cos\theta} \times \dfrac{1+\cos\theta}{1+\cos\theta}$ 1

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

$= \dfrac{\sin\theta\,(1+\cos\theta)}{\sin^2\theta} = \dfrac{1}{\sin\theta} + \dfrac{\cos\theta}{\sin\theta}$

$= \operatorname{cosec}\theta + \cot\theta = \text{RHS}$ $\frac{1}{2}$

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25. Three cubes each of volume 216 cm^3 are joined end to end to form a cuboid. Find the total surface area of resulting cuboid.

Sol. $a^3 = 216 \text{ cm}^3$

$a = 6$ cm 1

TSA of cuboid $= 5a^2 + 4a^2 + 5a^2$

$= 14a^2$ $\frac{1}{2}$

$= 504 \text{ cm}^2$ $\frac{1}{2}$

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26. Find the values of p for which the quadratic equation $x^2 - 2px + 1 = 0$ has no real roots.

Sol. For no real roots

$D < 0$

$(-2p)^2 - 4 \times 1 \times 1 < 0$ 1

$p^2 - 1 < 0$ $\frac{1}{2}$

$-1 < p < 1$ $\frac{1}{2}$

SECTION C

Question numbers 27 to 34 carry 3 marks each.

27. If 1 and –2 are the zeroes of the polynomial ($x^3 - 4x^2 - 7x + 10$), find its third zero.

Sol. The two factors of polynomials are $(x - 1)$, $(x + 2)$ $\frac{1}{2}$

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

$$\frac{x^3 - 4x^2 - 7x + 10}{x^2 + x - 2} = (x - 5)$$ $1\frac{1}{2}$

Third zero = 5 $\frac{1}{2}$

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28. Draw a circle of radius 3 cm. From a point 7 cm away from its centre, construct a pair of tangents to the circle.

Sol. Drawing a circle of radius 3 cm, marking Centre 0 and taking a point P such that OP = 7 cm 1

Constructing two tangents 2

OR

Draw a line segment of 8 cm and divide it in the ratio 3 : 4.

Sol. Drawing a line segment of 8 cm 1

Dividing it in the ratio 3 : 4 2

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29. A wire when bent in the form of an equilateral triangle encloses an area of $121\sqrt{3}$ cm^2. If the same wire is bent into the form of a circle, what will be the radius of the circle?

Sol. Let 'a' be the side of the equilateral triangle

$$\Rightarrow \frac{\sqrt{3}}{4}a^2 = 121\sqrt{3}$$ 1

$\Rightarrow a = 22$ cm $\frac{1}{2}$

Perimeter of triangle = 3a = 66 cm $\frac{1}{2}$

Hence, $2\pi r = 66$ cm $\frac{1}{2}$

$$r = \frac{33}{\pi}\text{ cm or } \frac{21}{2}\text{ cm}$$ $\frac{1}{2}$

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30. **Prove that $\dfrac{\cos\theta}{(1-\tan\theta)}+\dfrac{\sin\theta}{(1-\cot\theta)}$ = (cos θ + sin θ)**

Sol. LHS $= \dfrac{\cos\theta}{1-\tan\theta}+\dfrac{\sin\theta}{1-\cot\theta}$

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

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

$= \cos\theta + \sin\theta = \text{RHS}$ 1

OR

Prove that $(\sin\theta + \text{cosec}\,\theta)^2 + (\cos\theta + \sec\theta)^2 = 7 + \tan^2\theta + \cot^2\theta$.

Sol. $(\sin\theta + \text{cosec}\,\theta)^2 + (\cos\theta + \sec\theta)^2$

$= \sin^2\theta + \text{cosec}^2\theta + 2 + \cos^2\theta + \sec^2\theta + 2$ $\quad \frac{1}{2}+\frac{1}{2}$

$= \sin^2\theta + 1 + \cot^2\theta + 2 + \cos^2\theta + 1 + \tan^2\theta + 2$ $\quad \frac{1}{2}+\frac{1}{2}$

$= 7 + \tan^2\theta + \cot^2\theta$ 1

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31. **If $\sqrt{2}$ is given as an irrational number, then prove that $(7-2\sqrt{2})$ is an irrational number.**

Sol. Let $7-2\sqrt{2}=m,$ where m is a rational number $\quad \frac{1}{2}$

$$\sqrt{2}=\frac{7-m}{2} \quad 1$$

Irrational = Rational 1

$\Rightarrow$ LHS $\neq$ RHS

It means out assumption is wrong.

Hence, $7-2\sqrt{2}$ is irrational $\quad \frac{1}{2}$

OR

Find HCF of 44, 96 and 404 by prime factorization method. Hence find their LCM.

Sol. $\left.\begin{aligned} 44 &= 2^2 \times 11 \\ 96 &= 2^5 \times 3 \\ 404 &= 2^2 \times 101 \end{aligned}\right]$ $1\frac{1}{2}$

HCF = 2^2 = 4 $\frac{1}{2}$

LCM = $2^5 \times 11 \times 3 \times 101$

= 106656 1

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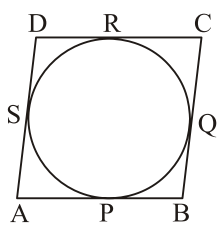
32. Prove that the parallelogram circumscribing a circle is a rhombus.

Sol. Correct figure $\frac{1}{2}$



$\left.\begin{aligned} AP &= AS \\ BP &= BQ \\ CQ &= CR \\ DR &= DS \end{aligned}\right]$ Tangents from external point 1

AB + DC = AP + PB + DR + RC

= AS + BQ + DS + CQ

= AD + BC 1

Since, ABCD is a llgm, AB = DC, AD = BC

2AB = 2AD

AB = AD

$\Rightarrow$ ABCD is a rhombus $\frac{1}{2}$

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33. **In Fig. 3, arrangement of desks in a classroom is shown. Ashima, Bharti and Asha are seated at A, B and C respectively. Answer the following:**

(i) Find whether the girls are sitting in a line.

(ii) If A, B and C are collinear, find the ratio in which point B divides the line segment joining A and C.

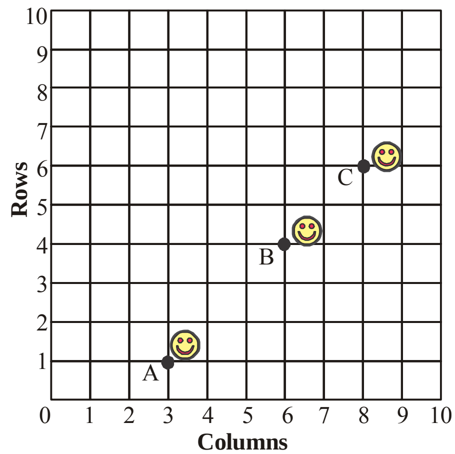

Fig. 3

Sol. Coordinates of A(3, 1)

B(6, 4)

C(8, 6) 1

(i) Area of $(\Delta ABC) = \frac{1}{2}[3(4-6)+6(6-1)+8(1-4)]$ $\frac{1}{2}$

$= 0$

Yes they are sitting in same line $\frac{1}{2}$

(ii) Let AB : BC = k : 1

$6 = \frac{8k+3}{k+1}$ $\frac{1}{2}$

$k = \frac{3}{2}$ or Ratio $= 3:2$ $\frac{1}{2}$

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34. **A number consists of two digits whose sum is 10. If 18 is subtracted from the number, its digit are reversed. Find the number.**

Sol. Let two digit number = 10x + y $\frac{1}{2}$

$x + y = 10$ ...(i) $\frac{1}{2}$

$10x + y - 18 = 10y + x$

$\Rightarrow$ $x - y = 2$ ...(ii) 1

On solving (i) & (ii) $x = 6$, $y = 4$ $\frac{1}{2}$

$\therefore$ Required number = 64 $\frac{1}{2}$

SECTION D

Question Nos. 35 to 40 carry 4 marks each.

35. Some students planned a picnic. The total budget for food was ₹ 2,000 but 5 students failed to attend the picnic and thus the cost for food for each member increased by ₹ 20. How many students attended the picnic and how much did each student pay for the food?

Sol. Let number of students be x

Cost of food for one student = ₹ $\frac{2000}{x}$ $\frac{1}{2}$

$(x-5)\left(\frac{2000}{x}+20\right)=2000$ 1

$x^2 - 5x - 500 = 0$

$(x - 25)(x + 20) = 0$ 1

$x = 25$ $\frac{1}{2}$

No. of students attended picnic = 20 $\frac{1}{2}$

Cost of food they pay = ₹ 100 $\frac{1}{2}$

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36. The sum of first 6 terms of an A.P. is 42. The ratio of its 10th term to 30th term is 1:3. Find the first and the 13th term of the A.P.

Sol. Here, $\frac{6}{2}(2a+5d)=42$

$\Rightarrow$ $2a + 5d = 14$ ...(i) 1

Also,

$\frac{a+9d}{a+29d}=\frac{1}{3}$ ...(ii) 1

$\Rightarrow$ $a = d$ $\frac{1}{2}$

Solving (i) and (ii), $7a = 14$ $\frac{1}{2}$

$\Rightarrow$ $a = 2$

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

$a_{13} = a + 12d = 26$ $\frac{1}{2}$

OR

Find the sum of all odd numbers between 100 and 300.

Sol. Odd number between 100 to 300 are 1

101, 103 ... 299

$299 = 101 + (n - 1)2$

$\Rightarrow n = 100$ 1

$S_n = \frac{100}{2}(101 + 299)$ 1

$= 20,000$ 1

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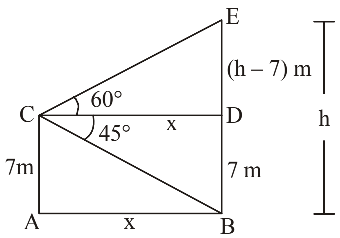
37. From the top of a 7 m high building, the angle of elevation of the top of a cable tower is 60°, and the angle of depression of its foot is 45°. Find the height of the tower. Given that $\sqrt{3}$ = 1.732.

Sol.



Correct figure 1

$\tan 45° = \frac{7}{x}$

$\Rightarrow x = 7$ m ...(i) 1

$\tan 60° = \frac{h-7}{x}$

$x\sqrt{3} = h - 7$ ....(ii) 1

Solving (i) and (ii), $h = 7(\sqrt{3}+1)$

$= 7 \times 2.732$

$= 19.124$ m 1

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38. In a right triangle, prove that the square of the hypotenuse is equal to sum of squares of the other two sides.

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

For correct proof 2

OR

Prove that the tangents drawn from an external point to a circle are equal in length.

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

For correct proof 2

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39. A hemispherical depression is cut out from one face of a cubical wooden block of edge 21 cm, such that the diameter of the hemisphere is equal to edge of the cube. Determine the volume of the remaining block.

Sol. Let r be the radius of hemisphere $\therefore$ r = $\frac{21}{2}$ cm $\frac{1}{2}$

Volume of remaining block = $a^3 - \frac{2}{3}\pi r^3$

$= (21)^3 - \frac{2}{3}\pi \times \frac{21}{2} \times \frac{21}{2} \times \frac{21}{2}$ 2

$= 9261\left[1 - \frac{\pi}{12}\right] \text{cm}^3$ 1

$= 6853 \text{ cm}^3$ (Approx.) $\frac{1}{2}$

OR

A solid metallic cylinder of diameter 12 cm and height 15 cm is melted and recast into 12 toys in the shape of a right circular cone mounted on a hemisphere of same radius. Find the radius of the hemisphere and total height of the toy, if the height of the cone is 3 times the radius.

Sol. Here, r = 6 cm

$\pi(6)^2 \times 15 = 12\left[\frac{1}{3}\pi r^2 \times 3r + \frac{2}{3}\pi r^3\right]$ 2

$36 \times 15 = \frac{12}{3}[3r^3 + 2r^3]$ $\frac{1}{2}$

$9 \times 15 = 5r^3$

r = 3 cm $\frac{1}{2}$

Total height = 12 cm 1

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40. Find the mean of the following data:

Classes	**0 – 10**	**10 – 20**	**20 – 30**	**30 – 40**	**40 – 50**	**50 – 60**	**60 – 70**
Frequency	**5**	**10**	**18**	**30**	**20**	**12**	**5**

Sol.

CI	f_i	x_i	d_i	u_i	f_iu_i
0-10	5	5	–30	–3	–15
10-20	10	15	–20	–2	–20
20-30	18	25	–10	–1	–18
30-40	30	35	0	0	0
40-50	25	45	10	1	20
50-60	12	55	20	2	24
60-70	5	65	30	3	15
Total	100				6

Correct Table 2

$$\text{mean} = A + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h$$

$$= 35 + \frac{6}{100} \times 10$$ 1

$$= \frac{356}{10} \text{ or } 35.6$$ 1