

Year 9 Term 1 Test Solutions

Student Name: _____	Grade: _____
Date: _____	Score: _____

- Answer the questions in the spaces provided on the question sheets.
- If you run out of room for an answer, continue on the back of the page.
- This test has 16 questions, for a total of 100 marks.
- Do not use a calculator.
- Attempt all 16 questions.
- Time allowed: 45 minutes.

Page:	1	2	3	4	5	6	Total
Points:	14	14	15	21	20	16	100
Score:							

This edition was printed on March 15, 2022.

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One and two step equation questions (Questions 1 through 3)

Question 1 (6 points)

Solve each of these equations, giving your answers as fractions or mixed numerals, in its simplest form.

(a) $7p + 27 = -18$

[2]

Solution: $7p + 27 = -18 \Rightarrow 7p = -18 - 27 \Rightarrow 7p = -45 \Rightarrow \therefore p = -6\frac{3}{7}$.

(b) $9q^2 = 16$

[2]

Solution: $9q^2 = 16 \Rightarrow q^2 = \frac{16}{9} \Rightarrow q = \pm\sqrt{\frac{16}{9}} \Rightarrow \therefore q = \pm 1\frac{1}{3}$.

(c) $81x^2 + 6 = 10$

[2]

Solution: $81x^2 + 6 = 10 \Rightarrow 81x^2 = 4 \Rightarrow x^2 = \frac{4}{81}$
 $\Rightarrow x = \pm\sqrt{\frac{4}{81}} \Rightarrow \therefore x = \pm\frac{2}{9}$.

Question 2 (4 points)

36 less than five times a number equals 124. What is the number?

Solution: $5N - 36 = 124 \Rightarrow 5N = 124 + 36$
 $5N = 160 \Rightarrow \therefore N = 32$.

Question 3 (4 points)

If $x + 3y^3 = 1$, what is the value of y then $x = 25$?

Solution: Given that $x + 3y^3 = 1 \Rightarrow 3y^3 = 1 - x$
 $\Rightarrow y^3 = \frac{1 - x}{3}$
 $\Rightarrow y = \sqrt[3]{\frac{1 - x}{3}} = \sqrt[3]{-8} = -2$.

Equations with pronumerals on both sides (Questions 4 through 6)

Question 4.....(6 points)

Solve the following equations:

(a) $8 - 6x = 12 + 4x$ [2]

Solution:

$$8 - 6x = 12 + 4x \Rightarrow 4x + 6x = 8 - 12 \Rightarrow 10x = -4$$

$$\Rightarrow \therefore x = -\frac{2}{5}.$$

(b) $1.2y - 2.6 = 2.8y + 4.2$ [2]

Solution:

$$1.2y - 2.6 = 2.8y + 4.2 \Rightarrow 2.8y - 1.2x = -2.6 - 4.2 \Rightarrow 1.6y = -6.8$$

$$\therefore y = -4.25 \text{ or } y = -4\frac{1}{4}.$$

(c) $-6 - 6z = 3 - 12z$ [2]

Solution:

$$-6 - 6z = 3 - 12z \Rightarrow 12z - 6z = 3 + 6 \Rightarrow 6z = 9$$

$$\Rightarrow \therefore z = 1\frac{1}{2}.$$

Question 5.....(4 points)

Six times a number equals 24 less than nine times the number. What is the number?

Solution:

$$6N = 9N - 24 \Rightarrow 9N - 6N = 24 \Rightarrow 3N = 24$$

$$\Rightarrow \therefore N = 8.$$

Question 6.....(4 points)

Two more than eight times a number is equal to the number increased by 100.

What is the number?

Solution:

$$8N + 2 = N + 100 \Rightarrow 8N - N = 100 - 2 \Rightarrow 7N = 98$$

$$\Rightarrow \therefore N = 14.$$

Equations with grouping symbols (Questions 7 through 9)

Question 7 (7 points)

Solve the following equations:

(a) $2(3y - 5) + 4(9 + y) = 166$ [2]

Solution:

$$2(3y - 5) + 4(9 + y) = 166 \Rightarrow 6y - 10 + 36 + 4y = 166$$

$$\Rightarrow 10y = 140 \Rightarrow \therefore y = 14.$$

(b) $4(5x + 3) - 4(6x - 5) = 0$ [2]

Solution:

$$4(5x + 3) - 4(6x - 5) = 0 \Rightarrow 20x + 12 - 24x + 20 = 0$$

$$\Rightarrow -4x = -32 \Rightarrow \therefore x = 8.$$

(c) $3(4 + 2x) + 2(5x - 9) - (3 + 8x) = 7$ [3]

Solution:

$$3(4 + 2x) + 2(5x - 9) - (3 + 8x) = 7$$

$$12 + 6x + 10x - 18 - 3 - 8x = 7$$

$$8x = 16 \Rightarrow \therefore x = 2.$$

Question 8 (4 points)

Two brothers are presently 2 years old and 14 years old respectively. How many years will have to pass before the elder brother is $2\frac{1}{2}$ times the age of younger brother?

Solution:

$$14 + N = 2\frac{1}{2}(2 + N) \Rightarrow 14 + N = 5 + 2\frac{1}{2}N$$

$$1\frac{1}{2}N = 9 \Rightarrow \therefore N = 6 \text{ Years.}$$

Question 9 (4 points)

Six years ago, John was twice the age of Tom. At present, John is 12 years older than Tom. Find the sum of the ages of the two men.

Solution:

$$\begin{cases} J - 6 = 2(T - 6) \dots (1) \\ J = T + 12 \dots (2) \end{cases} \Rightarrow T + 12 - 6 = 2T - 12$$

$$T = 18 \text{ years and } J = 18 + 12 = 30 \text{ years.}$$

$$\text{Sum of their ages: } = 18 + 30 = 48 \text{ years}$$

Equations with one or more than one fraction

Question 10 (21 points)

Solve the following equations:

(a) $\frac{x+9}{4} = x$ [2]

Solution: $\frac{x+9}{4} = x \Rightarrow x+9 = 4x \Rightarrow 3x = 9 \Rightarrow \therefore x = 3.$

(b) $\frac{9+8y}{7} + 6 = 13$ [3]

Solution: $\frac{9+8y}{7} + 6 = 13 \Rightarrow 9+8y+42 = 91$
 $8y = 40 \Rightarrow \therefore y = 5.$

(c) $3y - 12 = \frac{2}{3}y + 2$ [4]

Solution: $3y - 12 = \frac{2}{3}y + 2 \Rightarrow 9y - 36 = 2y + 6$
 $7y = 42 \Rightarrow \therefore y = 6.$

(d) $\frac{3x}{5} + \frac{x}{2} = 44$ [4]

Solution: $\frac{3x}{5} + \frac{x}{2} = 44 \Rightarrow 6x + 5x = 440$
 $11x = 440 \Rightarrow \therefore x = 40.$

(e) $\frac{a-3}{12} = \frac{1}{4}$ [4]

Solution: $\frac{a-3}{12} = \frac{1}{4} \Rightarrow 4a - 12 = 12$
 $4a = 24 \Rightarrow \therefore a = 6.$

(f) $\frac{1}{2}(b-3) + \frac{3}{5}(b+1) = \frac{2}{3}$ [4]

Solution: $\frac{1}{2}(b-3) + \frac{3}{5}(b+1) = \frac{2}{3} \Rightarrow 15(b-3) + 18(b+1) = 20$
 $15b - 45 + 18b + 18 = 20 \Rightarrow 33b = 47 \Rightarrow \therefore b = 1\frac{14}{33}.$

Evaluate the subject of a formula

Question 11 (8 points)

Find the value of the subject in each formula given that:

(a) If $y = mx + b$ when $m = 4$, $x = 8$ and $b = -5$. [4]

Solution:

$$y = mx + b = 4 \times 8 + (-5) = 27.$$

(b) If $R = \sqrt{a^2 + b^2}$, find R when $a = 2$, $b = \sqrt{5}$. [4]

Solution:

$$\begin{aligned} R &= \sqrt{a^2 + b^2} \\ &= \sqrt{2^2 + (\sqrt{5})^2} = \pm 3. \end{aligned}$$

Changing the Subject of a Formula

Question 12 (12 points)

Transpose each formula so that **y** is the subject:

(a) $x = 3(y + z)$ [4]

Solution:

$$\begin{aligned} x &= 3(y + z) \Rightarrow x = 3y + 3z \Rightarrow 3y = x - 3z \\ \therefore y &= \frac{x - 3z}{3}. \end{aligned}$$

(b) $c = \frac{a-by}{y-b}$, where a, b and c are constants. [4]

Solution:

$$\begin{aligned} c &= \frac{a-by}{y-b} \Rightarrow c(y-b) = a-by \Rightarrow cy - cb = a-by \\ cy + by &= a + cb \Rightarrow y(c+b) = a + cb \Rightarrow \therefore y = \frac{a+cb}{c+b}. \end{aligned}$$

(c) $a = 2\pi \left(b + \frac{y}{2}\right)$, where a and b are constants. [4]

Solution:

$$\begin{aligned} a &= 2\pi \left(b + \frac{y}{2}\right) \quad b + \frac{y}{2} = \frac{a}{2\pi} \\ \frac{y}{2} &= \frac{a}{2\pi} - b \Rightarrow \therefore y = 2 \left(\frac{a}{2\pi} - b\right) \\ \text{or } y &= \frac{a}{\pi} - 2b. \end{aligned}$$

Problem Solving (Questions 13 through 16)

Question 13.....(4 points)

If the numerator and denominator in the fraction $\frac{3}{11}$ are increased by a certain number, the resulting fraction would then be $\frac{2}{3}$. Find the number.

Solution:

$$\frac{3+N}{11+N} = \frac{2}{3} \Rightarrow 3((3+N) = 2(11+N))$$

$$9 + 3N = 22 + 2N \Rightarrow \therefore N = 13.$$

Question 14.....(4 points)

Eight more than three-quarters of a number is 32. What is the number?

Solution:

$$\frac{3}{4}N + 8 = 32 \Rightarrow 3N + 32 = 128$$

$$\Rightarrow 3N = 96 \Rightarrow \therefore N = 32.$$

Question 15.....(4 points)

A number added to a half itself the result is $\frac{1}{6}$. What is the number?

Solution:

$$N + \frac{N}{2} = \frac{1}{6} \Rightarrow 6N + 3N = 1$$

$$\Rightarrow 9N = 1 \Rightarrow \therefore N = \frac{1}{9}.$$

Question 16.....(4 points)

If $d = \frac{2}{3}t^2$, find a possible value of t when $d = 2400$.

Solution:

$$\text{Given that } d = \frac{2}{3}t^2 \Rightarrow t^2 = \frac{3}{2}d$$

$$\therefore t = \sqrt{\frac{3}{2} \times 2400} = \sqrt{3600} = 60.$$